Volume 10, No. 4 **July, 1955**

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. . . H. O. HENDERSON AND I. O. HEMBRE

Book Reviews: Elements of Soil Conservation; The Life and Times of a Happy Liberal; also Land Judging.

Tenth Annual Meeting of the Soil Conservation Society of America, September 12-14, 1955, Green Lake, Wisconsin

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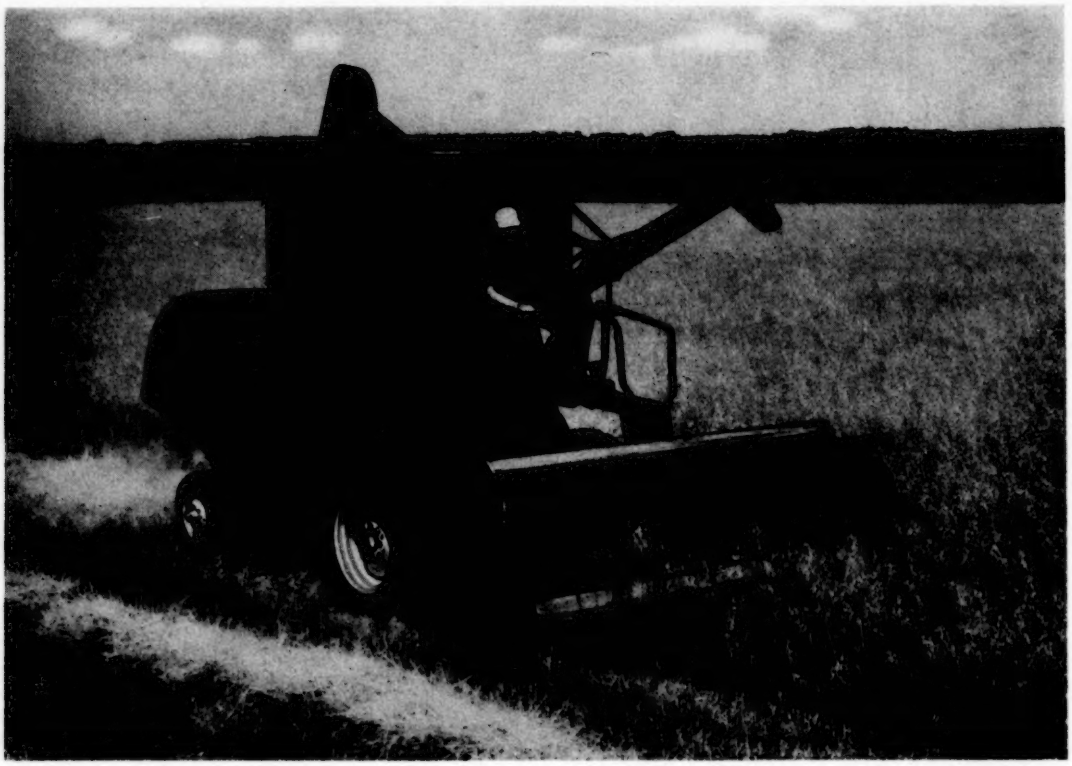

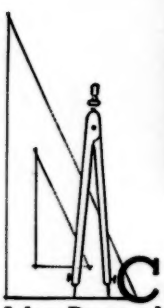

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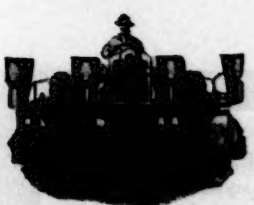

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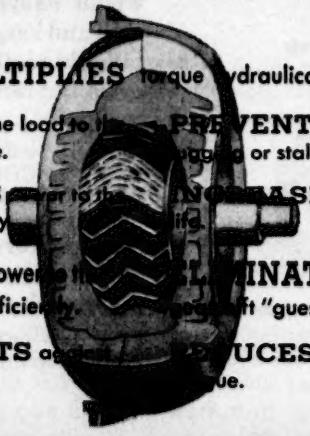

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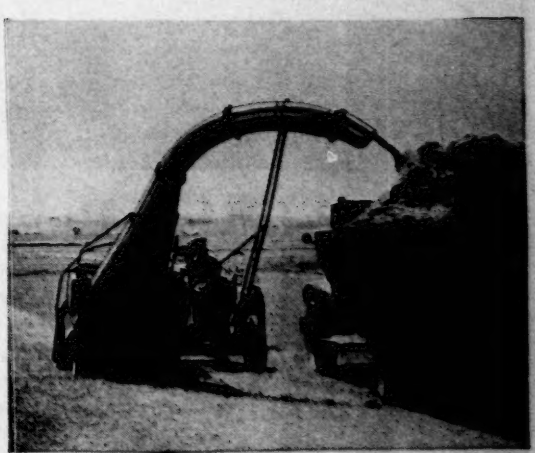

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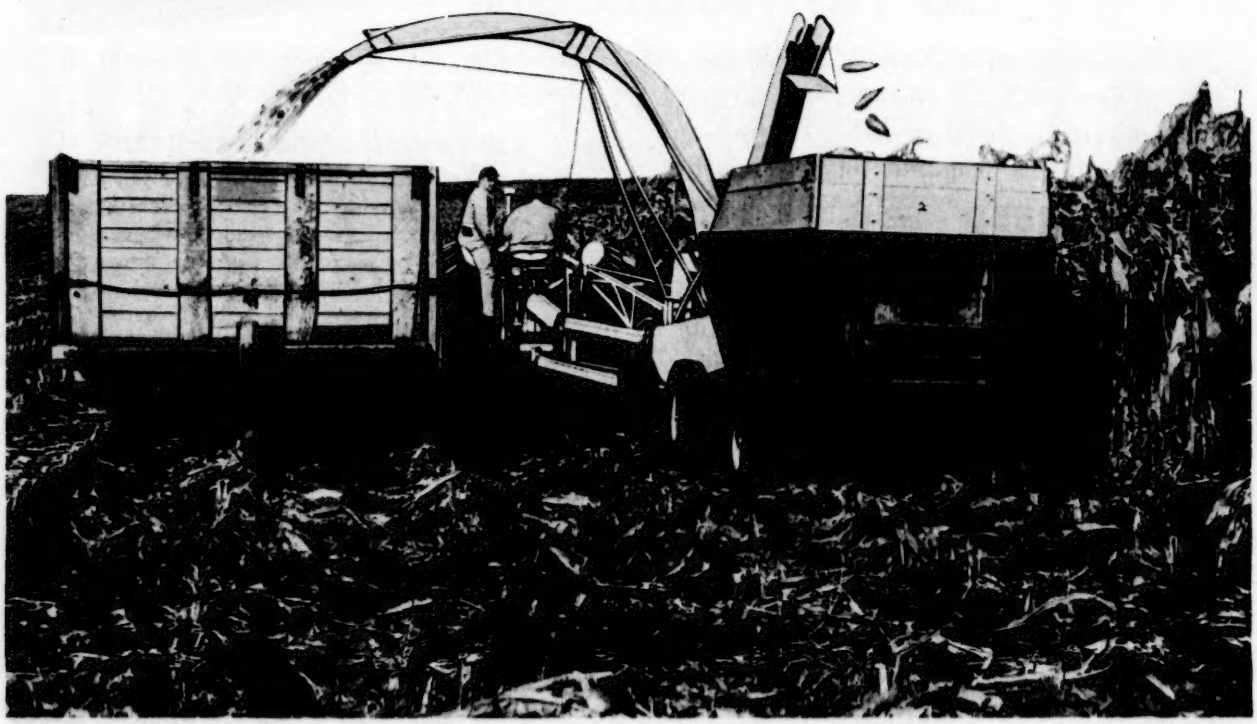

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VOLUME 10
NUMBER 4

Journal of SOIL AND WATER CONSERVATION

TO ADVANCE THE SCIENCE AND ART OF GOOD LAND USE

This JOURNAL is the official organ of the Soil Conservation Society of America. It is owned, edited, and published bimonthly by the Society.

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NATIONAL HEADQUARTERS AND SECRETARY'S OFFICE: Suite 1016 Paramount Building, Des Moines 9, Iowa.

POST OFFICE ENTRY: Second class mail privileges authorized at Des Moines, Iowa.

MEMBERSHIP: Annual membership is on a calendar year basis and is $5.00 per year of which $1.50 is for subscription to the JOURNAL and 25c for NOTES AND ACTIVITIES. Subscription for the JOURNAL to libraries and others is $5.00 per year. Single copies are 85c each.

CORRESPONDENCE — Concerning manuscripts, books for review and other editorial matter should be sent to the Editor, P.O. Box 1392, Fairmont, West Virginia.

BUSINESS CORRESPONDENCE—Concerning remittances and questions should be sent to the Executive Secretary, Suite 1016 Paramount Building, Des Moines 9, Iowa.

CHANGE OF ADDRESS: Notice of change in address should be received two weeks before the date of issue on which the change is to take effect. Both the old and the new address should be sent to the office of the Secretary.

REPRINTS: Articles appearing in this publication may be reprinted on condition that full credit be given the JOURNAL OF SOIL AND WATER CONSERVATION and the author; also the date of publication.

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This aerial view shows eight years' progress in soil conservation and farm management in the Pine Hollow community, Wisconsin. Formerly gullied fields show the healing effect of strip cropping, contour farming, and changes in land use.

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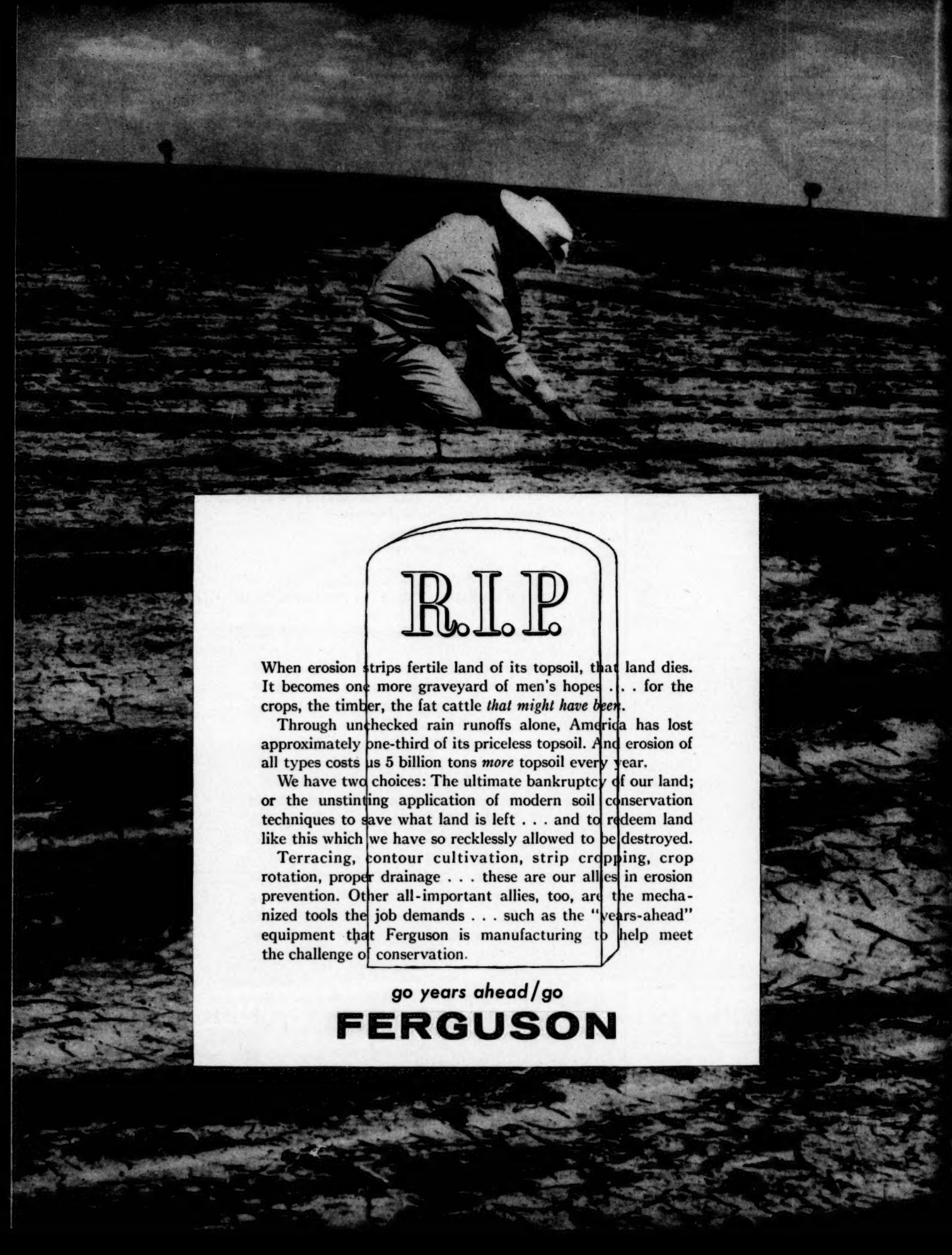

R.I.P

When erosion strips fertile land of its topsoil, that land dies. It becomes one more graveyard of men's hopes . . . for the crops, the timber, the fat cattle *that might have been*.

Through unchecked rain runoffs alone, America has lost approximately one-third of its priceless topsoil. And erosion of all types costs us 5 billion tons *more* topsoil every year.

We have two choices: The ultimate bankruptcy of our land; or the unstinting application of modern soil conservation techniques to save what land is left . . . and to redeem land like this which we have so recklessly allowed to be destroyed.

Terracing, contour cultivation, strip cropping, crop rotation, proper drainage . . . these are our allies in erosion prevention. Other all-important allies, too, are the mechanized tools the job demands . . . such as the "years-ahead" equipment that Ferguson is manufacturing to help meet the challenge of conservation.

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FERGUSON

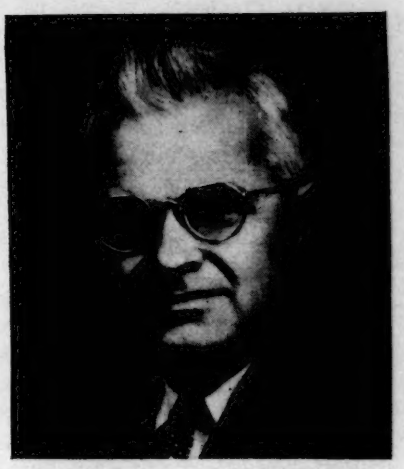
Land Classification as a Guide In Production Adjustment Programs

Clay H. Stackhouse, Warren R. Bailey,
W. H. Allaway, Roy D. Hockensmith and Gordon K. Zimmerman

Foreword

Ideally, wise land use and production adjustment should be not only compatible, but mutually complementary. Actions farmers take from year to year toward better use of resources should be of aid, simultaneously, in desirable diversification and adjustment of crop production. Similarly, production adjustments should be made in such a way as to provide the best possible protection and efficient use of natural resources.

Present practice falls considerably short of the ideal, but as a nation we are making progress in the right direction. As is so often the case, one of the major needs in support of this trend is additional knowledge. Specifically, there is need for much more acre-by-acre knowledge about the use-capabilities of America's farmlands. There is need, too, for more proficient use of the land capability information already available.



Herschel D. Newsom

Eventually, farm-by-farm and field-by-field knowledge of land capabilities throughout America will provide farmers with one of the best possible guides in making efficient production adjustments—toward smaller or larger acreage of cultivated crops and toward beneficial crop diversification. The authors of the following article, which first appeared as a Special Research Committee Report of Potomac Grange No. 1 in Washington, D. C., have done an admirable job, in my opinion, in charting a sensible course to wider acceptance of land capability values.—Herschel D. Newsom.

FOR NEARLY TWENTY years, the Congress has authorized production controls on basic crops to go into effect whenever these crops were in "abnormally excessive supply." In the main, these controls have been effected by means of acreage allotments apportioned in turn to states, counties and individual farms. According to law, this apportionment to states and counties, with some modification from time to time, was based primarily on past acreage of the crop. Apportionment to individual farms was authorized not only on the basis of past acreage, but on crop rotation practices in the locality, type of soil, and topography. While these four general considerations for farm apportionment have been provided in the law, in practice the primary basis used for allotments has been the historical acreage.

Serious objections are being raised to the continued primary dependence on the historical base. In application, it frequently conflicts with programs for conservation and wise development of land and water resources. In many instances, it tends to perpetuate, with government sanction, physically unsound patterns of land use. In other areas, of more uniformly good soils, the historical base may prevent changes in farming that would be economically desirable in the longer run.

In recent months, however, the classification of land according to its physical capabilities for use, as now employed widely in the country, has commanded increasing attention as a *potential and partial* alternative to the historical base. Many proponents believe that land classification, if used as a guide in the apportionment of acreage allotments, would go far in reconciling the long-range aims of increased agricultural efficiency and resource

Herschel D. Newsom is master of the National Grange, Washington, D. C.; Clay H. Stackhouse is assistant deputy administrator, Production Adjustment, Commodity Stabilization Service; Warren R. Bailey is head, Western Field Research Station, Production Economics Research, Agricultural Research Service; W. H. Allaway is assistant head, Eastern Soil and Water Management Section, Soil and Water Conservation Research, Agricultural Research Service; Roy D. Hockensmith is director, Soil Survey Operations, Soil Conservation Service; and Gordon K. Zimmerman, National Agricultural Research, Incorporated—all members of a special research committee of Potomac Grange located in Washington, D. C.

Members of this committee have participated as individuals and it is not to be inferred that the views of this report in any way represent the views of the organizations with which they are connected.

conservation with the intermittent need for short-range reductions in production.

Several problems would be involved in making a shift away from the historical toward the land capability base. Obviously, any precipitated action would be impractical and wholly undesirable. An orderly transition would be necessary. Proponents of this use of land capability classification believe that existing problems can be worked out successfully by testing promising principles and procedures in a few pilot counties where adequate soil survey information is already available and where the local people are willing and eager to cooperate in the development of an improved program.

The Problem

Present farm law provides for acreage allotments and other means of production adjustment when the supply of certain crops substantially exceeds effective demand. Generally speaking, acreage limitation programs are regarded as short-range or temporary programs. Other parts of the farm program are directed toward the interrelated goals of soil and water conservation, price supports, improved farm living, and more efficient farming. For the most effective, total program, we must find ways to harmonize to a greater degree our short-range production adjustment goals with our long-range efforts for increased efficiency in farming.

The use of the historical base tends toward a poor allocation of resources. The prospect of a production reduction program employing the historical base has induced many farmers to maintain higher acreages of the "basic" crops than they otherwise would have done. Use of the historical base has frequently penalized economically those farmers who have already voluntarily reduced their acreage of "soil depleting" crops in order to develop a balanced conservation plan for their farms.

It should be emphasized that the apportionment of acreage allotments for certain crops among the individual farms of a county "by the Secretary, through the local committees" is supposed to be made on the basis of "tillable acreage, crop rotation practices, type of soil, and topography." Additional adjustments in the base acreage used in figuring allotments for "basic" crops may be made whenever the local committees determine that bases for individudal farms have been established either too high or too low in comparison with similar farming units in a county. This type of apportionment, however, would require local committees to exercise a degree of judgment on the quality of their neighbors' land and farming operations. In practice, the committees have in most instances been reluctant to exercise such judgment with the attendant economic consequences to their neighbors. They have normally employed, instead, the historical base.

The use of land capability classification would offer the committees an opportunity to exercise on an objective basis the authority already granted to them by law.

Need and opportunity for adjustments on land capability basis. The adjustment of our agricultural systems to conform more nearly with the capabilities of the land has two interrelated aspects: (1) The major type of use, such as cropping, grazing, and forestry; and (2) the system of crops and soil management within the major use. Both types of adjustment are important to soil and water conservation and efficiency in farming, and both are influenced by production adjustment programs.

Adjustments in major type of use. It is well known that the historical distributions of such crops as wheat, corn, cotton, peanuts, and potatoes are not directly related to the pattern of soils suitable for their production. Nor are the soils suitable for such crops distributed in anything like similar proportions from farm to farm. In other words, there are many farms on which most of the soil is highly suitable for corn and wheat; and there are other farms on which there is little if any soil suitable for these crops on a continuing basis.

Much land unsuitable for cultivation is now being used for production of tilled and so-called "cash" crops. According to the most recent estimates of the Soil Conservation Service, 39 million acres of privately-owned land used for "cash crop" production are not suitable for that use.

Another 47 million acres of distinctly marginal soils are also being used for such crops. Under very careful management, these acres can be safely and economically cultivated, but generally they are better adapted to other uses, especially improved pasture.

Meanwhile, around 200 million acres suitable for crops are now being used for grass or for woods.

These facts make it obvious that to achieve our goals of soil and water conservation, and increased efficiency in farming, we need a substantial readjustment in land-use on individual farms. Gradually, also, some shifts in land-use are needed among farms, counties, and states. Such shifts *by themselves* would have the long-run tendency to increase our productive capacity.

Fortunately for our agricultural economy, the United States will require a long-run aggregate increase in production despite the fact that we now have temporary surpluses of certain crops. It also appears that the greatest increase in demand will be for livestock products, which can be produced economically from forage. From time to time, however, and even though we are eventually successful in developing programs leading steadily toward use of land in greater conformity with its capability, and thereby achieved greater conservation and efficiency, we

may also need programs to reduce production of crops that are temporarily in surplus. This means limitations on the use of some lands that are clearly suitable for crops.

Adjustments in soil management systems on cropland. Besides shifts in major land uses, as from cultivated crops to grass, we also need important shifts in soil and crop management on the present cropland that is suitable for crops. For example, a good grass-legume crop is grown on many farms in the South and Middlewest only once in 8 or 10 years. Yet good husbandry would dictate such a grass-legume crop once in every 3 to 4 years.

Adjustments in this direction would improve the rotations on a great deal of cropland and would materially improve the soils in both structure and fertility. Such shifts would reduce erosion because they would reduce the acreage annually used for production of such crops as corn and cotton. But the long-time effect would be to increase the yields per-acre of these crops and to increase the total production of feed if we count the increased production of hay and pasture under good systems of soil conservation.

Production Adjustment Utilizing Land Capability Classification

From the point of view of *technical feasibility alone*, even granting the relatively imperfect state of knowledge about soil use and management, it would be possible to redistribute our land uses and shift our crop and soil management practices in accordance with the capabilities of the soils, based on accurate soil surveys. With the knowledge now at hand, it is technically possible to achieve this goal and, at the same time, have either a larger or a smaller total production. The technical problems involved are no different in principle from those which govern the selection and management of crops in relation to the soil patterns on individual farms. This is being done now, for example, by many individual cooperators in soil conservation districts.

General requirements. Technical feasibility, however, is not the prime factor at the present time or in the years ahead. It is clearly recognized that our total agricultural production results from the decisions made on millions of individual farms. Any successful program for using land classification as a partial guide in production adjustment, therefore, must take account of several factors besides technical feasibility. It should be recognized, for example, that:

1. The program must be understood by, and have the support of, the majority of American farmers if it is to work effectively.

2. On many farms, land-use adjustments can be made only gradually and need to be supported by other parts of the total agricultural program, including technical assistance, credit, and incentives that make it possible for individual farmers to cooperate and carry on successfully. This means a somewhat closer integration, perhaps, of the various phases of the Department's program than has been found necessary heretofore.

3. The principles embodied in this classification and the reasons for placing any unit of land in a particular capability class must be thoroughly reviewed and understood by the local committee in charge of the adjustment program. The local committees should not, however, be required to classify the kinds of soil on the farms in their counties. Classification should be the function of trained soil scientists.

Recommendations

It is recommended that the Department of Agriculture, Land-Grant colleges, and Soil Conservation districts make a serious cooperative study and trial of land capability classification as *an important element* of the apportionment of acreage allotments. It is not recommended that such classification be considered at this time as a complete substitute for the historical base.

It is recommended that an attempt be made to develop effective principles and procedures for the use of land classification data in production adjustment for a few representative counties in the country. Tests of these principles and procedures in "pilot" areas would then provide the necessary experience as a basis for working out a national program. The experimental "pilot" counties should be selected, of course, to represent important types of agriculture and "basic" crop production. They should also be counties where the necessary land-use-capability information is already available, as a result of suitable surveys, and where the local people are willing to cooperate in developing an improved program of production adjustment consistent with good land use.

Anticipated Problems

A number of administrative and policy problems would be involved in developing a system whereby land classification would serve as a guide in connection with production adjustment. For example:

1. Acceptable crop alternatives to the "surplus" crops would have to be known, and also the extent of any cross-compliance requirements in the adjustment program. The pattern of adjustment would also be influenced by the level of price support and marketing opportunities for the crops involved.

2. Incentives in addition to price supports will be necessary to bring about effective cropping adjustments

that avoid cultivation of land unsuited for such intensive use and that prevent serious soil deterioration, such as wind and water erosion. These incentives may include (a) assistance for the purchase or lease of land for either a new farm or an enlarged farm unit, (b) agricultural credit, (c) educational services, (d) on-site technical assistance, (e) cost-sharing for conservation practices, including establishment of permanent pastures, and (f) adjustment or transitional allowances, in some instances, to help sustain farm income for the 3 to 5 years required for the producer to shift to good land use. Such adjustment or transitional allowances would be especially significant in shifts from predominantly cash crop farming to livestock farming.

3. The establishment of new land uses may also require the development of new community services such as electric power and marketing and processing facilities. A community-wide shift from cotton production to dairying, for example, might require establishment of new pasteurizing and milk distribution facilities. Extensive clearing and drainage of bottomland for the production of truck crops might also call for new or additional processing and distribution facilities.

Kind of Land Classification Required

For such a program, a land classification is needed that groups kinds of soil according to their adaptabilities to crops, individually and in rotations, potential responses to management, and management requirements for efficient sustained use. The groups must be defined in objective terms and they must have approximately the same degree of homogeneity countrywide.

Such a land classification according to use capability is developed by interpretation from a standard soil survey that is built on basic soil characteristics. This factor is exceedingly important. The use-capability groups are based primarily on those physical characteristics of land affecting both crop yields and the management requirements for efficient, sustained production.

To remain useful, however, land classification needs continual revision and refinement. These adjustments are easily made by periodic reinterpretation and regrouping of the kinds of soil shown in the standard soil survey. In this way, land classification can be kept current and appropriate to changing agricultural conditions.

Technically, land capability classification is not new; rather, it is an additional development and wider use of the established soil survey. It is now being used increasingly in the technical assistance, education, and research programs of the Department and Land-Grant colleges.

Land Classification Data Now Available

Ample soil maps and other data are now available to work out principles and procedures in selected "pilot" counties in representative parts of the country. Enough information is also available about the soils of the country to make reasonable adjustments in state apportionments and to weigh land capability along with historical production. Within a few states there are sufficient data about soils to make reasonable adjustments among counties.

Land capability classification of a quality adequate for use in adjustment programs is now available for approximately 350 million acres. Past surveys of an additional 150 million acres could be made adequate with some significant revision. From the long-range point of view, considering all agricultural programs, land classification is needed for an additional 800 million acres in farms. However, with the classification of about one-half of this acreage, or around 400 million acres, there would be an adequate basis for making nation-wide decisions in furtherance of desirable production adjustment, apportionment of allotments, and major shifts in land use.

Science Is Knowledge

Science, as its name implies, is primarily knowledge; by convention it is knowledge of a certain kind, the kind, namely, which seeks general laws connecting a number of particular facts. Gradually, however, the aspect of science as knowledge is being thrust into the background by the aspect of science as the power of manipulating nature. It is because science gives us the power of manipulating nature that it has more social importance than art. Science as the pursuit of truth is the equal, but not the superior, of art. Science as a technique, though it may have little intrinsic value, has a practical importance to which art cannot aspire.

—BERTRAND RUSSELL, *The Scientific Outlook*

We Know How to Prevent Dust Bowls

J. S. RUSSELL

Dust bowls and wind erosion, points out the author of this revealing article, are the obvious results of land abuse coupled with unfavorable weather conditions. In this connection, he states that millions of acres of low-capability land have been put to wheat and other crops which should never have been cultivated.

We have actually adopted policies, says the author, that encourage this abuse instead of having a national land use policy to prevent dissipation of our resources. We need to speed up land classification and then really work toward the end of using the land for purposes for which it is best suited.

WE AS A NATION are wasting our natural resources. *We are mortgaging the future productive capacity of the United States through failure to observe a national land use policy. We are wasting fertility by growing crops that we don't need and by cropping areas of low capability. We are permitting the soil itself to be wasted and blown away.*

All this is in spite of real progress made in conservation and wide acceptance on the part of farmers and the public generally of the principles of conservation of our soil and water resources.

But the work of the federal, state and local agencies in the field of conservation and the programs designed to encourage better land use and to restrict certain crop acreages are being offset to a large extent because of the wasteful practices. We are planting more than 350 million acres to crops this year, or 11 million acres more than we had in crops 15 years ago. Increased acreage of certain crops like soybeans, oats, grain sorghums have more than offset reduced acreages of crops under control like wheat, cotton and corn. Hay acreage hasn't changed much.

And so we continue to cultivate more acreage than we need.

Surplus Wheat Represents Soil Fertility

Take for instance the carry-over of a billion bushels of wheat—the equivalent of a full year's production. That represents soil fertility used in producing a crop for which there is no market. And other crops and commodities such as cotton and butter acquired by the government in line with price support activities are a part of the same story.

Certainly there is value in having on hand a stockpile of grains and other commodities but these are of value up only to a certain point. Beyond that they must be considered as surplus and a stockpile of soil fertility might be far more useful since we are now striving with might and main to sell, trade or give away some of this surplus.

Figure 1. This is not a thirst crazed individual stumbling the last mile in quest of water, but J. S. Russell, the author of this article, caught in the act of stooping to examine a dust blown field south of Lamar, Colorado, last April.

But the accumulation in the case of wheat, for instance, ties in with another of the evidences of poor land use and of farming land which might better have been left in grass.

The Great Plains states dust storms early in 1955 resulted in damage from wind erosion to 13 million acres of land.

Much of this land is in eastern Colorado, western Kansas, western Texas and Oklahoma and northeastern New Mexico.

And much of it is land that is rated as submarginal or marginal in an area where the annual rainfall normally is the minimum for producing crops and where precipitation has been below normal much of the time for the last 20 to 25 years.

The high prices for wheat during and immediately after World War II along with some years of adequate

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Figure 2. *Top:* Only the rubber tires on the nearly buried farm implement distinguish this photo from similar ones made in the dust bowl of the thirties. This field, however, is in southeastern Colorado, where prolonged drouth conditions and severe wind erosion have turned fields into seas of yellowish-brown dust that stretch to the horizon. *Bottom:* C. L. Etter, of Lamar, conservationist for the Soil Conservation Service in southeastern Colorado, walks along the top of a dust drift that is almost as high as the tops of the fence posts.

and well distributed rainfall accounted for a big expansion in wheat acreage in the southern Great Plains area in the 1940's.

Some folks argue that it is drought and the weather that causes dust storms and creation of dust bowl areas. It is obvious that these factors do contribute to such conditions but dust bowls also are man made—at least in part.

We have the know-how to conquer most of the ravages of unfavorable weather if we only will use it.

The heart of the dust bowl area of the late 1930s with its pitted fields and sand dunes in the Oklahoma-Texas panhandle isn't the worst affected area this year. Many of these fields were returned to grass after being leveled and they are holding fast today as the dusters and black blizzards rage once again. Worst damaged areas are to the north and the south of this particular "old dust bowl" center.

After having learned our lesson in the 1930's when the dust bowl situation was recognized as a national problem, just why are we heading back in the same direction again?

Land of Low Capability in Vulnerable Position

H. H. Finnell, a grand old man of the Soil Conservation Service and more recently of the Agricultural Research Service, who has devoted much of his life to trying to find the answer to some of the problems of this semi-arid region, told at Goodwell, Oklahoma, why he thinks we are heading for trouble.

It was the plowing up of four million acres of land of low capability—three million of it submarginal—in the 1940's that placed so much of the land in a vulnerable position.

He had predicted four years ago that we had new dust bowls in the making provided precipitation continued below normal for several consecutive years—and it has.

The four million acres plowed up during the 1940's is only a part of the land in danger and now being damaged. The fact that 13 million acres of land was damaged by wind erosion is evidence enough that a lot of marginal and submarginal land has been broken up and put into crops.

The southern Great Plains states are not the only ones in which we have been overcropping and trying to farm land of low capability but it today presents the most striking example of land abuse and of lack of a national land use policy.

In the 1930's when the black blizzards sent dust swirling over much of the nation, we took steps to lick the dust bowl. The Soil Conservation Service working with some of the early soil conservation districts and with federal and state agencies got the job done.

We know how but we failed to follow through in applying the techniques.

Some of the worst of the damaged land was leveled off and put back into grass. Use of cover crops (leaving the grain sorghum and the wheat stubble on the fields was found to be helpful), cultivation of the fields in the spring to cut down blowing, use of diversion ditches, terraces and contour furrows to hold moisture on the land proved helpful in this low rainfall area.

These methods still are getting results as conservation practices are applied.

Kansas State College in reporting on research on "how to reduce dust storms" stresses the value of emergency

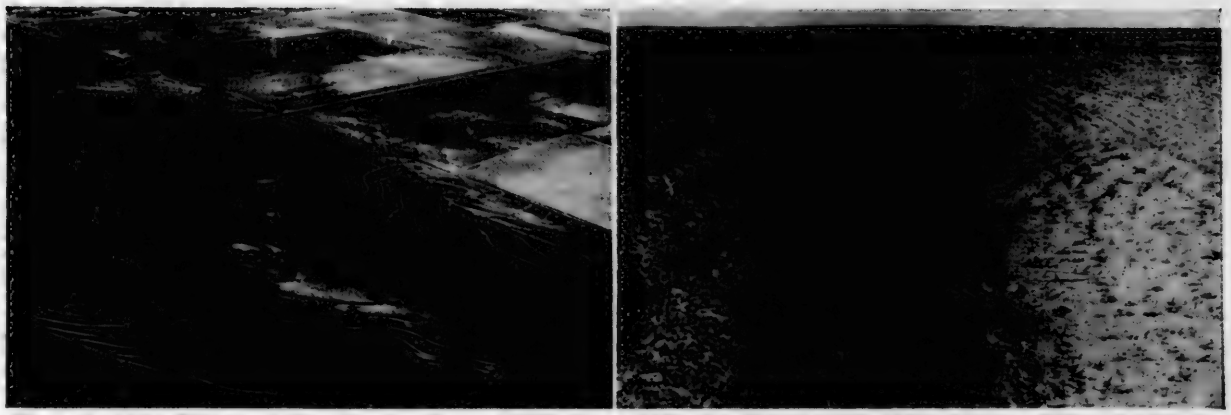

Figure 3. *Left:* This scene shows contour furrows holding water after a rain near Garden City, Kansas. *Right:* A Colorado wheat field in mid-April showing the results of listing on the left.

tillage, vegetative cover, strip cropping to cut down the blowing and community co-operative action.

"Soil blowing grows like a rolling snowball; it increases in intensity as it spreads out from its origin," states the Kansas bulletin and this explains why the problem of wind erosion must be dealt with on a broad scale instead of piecemeal.

Grass on the range land in southeastern Colorado this year was observed to be damaged because adjoining fields had been plowed. And so there was land on the verge of abandonment even though the owner of the range had taken all necessary precautions to protect his own land. The neighbor's abuse, however, was costing the rancher and cutting down on the carrying power of his land.

Conservation Agencies Are Doing a Good Job

The Soil Conservation Service and other federal and state agencies and the soil conservation districts are doing a fine job in guiding emergency tillage programs and showing farmers what can be done by leaving protective stubble on grain and sorghum fields, but that isn't enough to get the job done.

Back in the 1930's a considerable acreage of land was purchased—or rather taken up—by the federal government and put back into grass. The pressure is strong these days to have some of this land released for tillage but at least it has been protected as soil-holding crops were planted.

Some way of getting a part of this land of low capability in semi-arid areas out of wheat and back into grass has been discussed at great length.

Secretary of Agriculture Ezra T. Benson has announced that he is dead set against federal purchase of land to take it out of production—a "land grab" as he calls it.

A press release from the Department of Agriculture which announced that 13 million acres of land had been damaged by wind erosion stated:

"A long range program of proper land use and conservation farming and ranching methods is the only cure for these recurring dust bowls."

This statement is certainly true but it is going to take more than anything now in the picture to get this done. This is in no way any slur on either the Soil Conservation Service program or the Agricultural Conservation Program or emergency tillage or any program now in effect, but the fact remains that until someone takes a big lot of land completely out of production in this general area—and perhaps in some others—we will continue to have recurring dust storms and dust bowls in any period when rainfall is below normal or poorly distributed for several successive years.

Senator Ed Thye of Minnesota has a bill in Congress to make possible under the Bankhead-Jones Act the purchase by the federal government of some of this land for the purpose of putting it back into grass.

Federal purchase is objectionable to many persons, although Senator Clinton P. Anderson of New Mexico, a former secretary of agriculture, recalls that back in the days of the depression and dust storms in the 1930s he helped buy up quite a bit of land in his home state as an employee of one of the federal agencies. Suggestions have been coming from a number of persons, organizations and agencies that something be done to check this waste of our natural resources.

The American Farm Bureau Federation and the National Farmers Union which frequently have not seen eye to eye with each other appear to be in agreement on some aspects of getting out of production some of the land to conserve it for possible future use.

The Farm Bureau has endorsed the soil fertility bank idea of giving farmers some incentive to take land out of crop production and keep it in grass.

The Farmers Union favors the conservation acreage reserve idea.

The Izaak Walton League has been backing a plan

Figure 4. Chiseling, as is being done on this field, is considered an important practice to stop blowing as well as a means to hold water in the soil.

for the government to rent outright some 30 to 60 million acres of land and put it into grass and have this program gradually replace the price supports now in effect.

Retiring Land from Cultivation to Grass

The recommendations of the American Assembly conducted by Columbia University recently on agricultural policy included consideration of some plan of renting land from owners by the government.

The National Planning Association has under consideration a plan to retire land from cultivation and get it into grass. This would be done piecemeal in most areas but would require large scale and long-time arrangements in the dust bowl area.

The discussion at the governors' drought conference at Denver, Colorado, was along the lines of incentive payments and special tax credits for those farmers who follow recommendations on land use as indicated by the land classification. First it would be necessary to speed up the SCS land classification work completed.

The only trouble with a glorified ACP program as applied to the southern Great Plains area is that it probably would have little appeal to the suitcase farmers who have helped ruin this area.

Secretary Benson drew some sharp criticism from mention of suitcase farmers in his speech last April in Hutchinson, Kansas, and perhaps it would have been a little more to the point if he had made the reference farther west in southeastern Colorado.

In some of those areas it is undoubtedly due to the inherent right of every American to do as he pleases that brought many wheat ranchers from other areas into eastern Colorado in the 1940's to cash in on good yields, high market prices and some assurance of security under the wheat price support program. Much of the plowup was not to meet wartime needs but came after the war. The largest planted acreage of winter wheat in the United States in recent years was in 1949.

It would seem to be much more effective in the case of large wheat acreages in the southern Great Plains to take whole units out of production rather than to depend on diverting a portion of the farm to some other crop and it would need to be for more than a single year to do much good.

The Izaak Walton League plan is aimed at cutting down production of surplus crops and this should be considered as a factor, but this year a reduction of wheat acreage of ten million acres in the Texas-Colorado-west Kansas territory could be made without making much of a dent in the wheat crop. In the areas not damaged by wind erosion, dry weather cut severely into the wheat prospects. In 1954 out of a total of 46 million acres planted to winter wheat, only 38.6 million acres were harvested and much of abandonment was in the area where the dust was blowing last year—and again this year.

There are other areas in the United States where application of good land use would change the cropping pattern. In the southeastern states and elsewhere planting of some of the land to trees is a step in the right direction.

Attention is being directed primarily to the dust-blown area because that is the most glaring example of dissipation of natural resources and deterioration of the soil that might be put to a much better use. And, incidentally, we are already spending millions in keeping some of these wheat farmers on the land in payments for crop insurance, emergency tillage and ACP.

Let's Not Subsidize Poor Land

Just suppose that our population continues to grow and along with it our need for food. Or suppose that catastrophe should strike this nation or some other part of the world and we had to answer a cry for help to relieve famine.

Wouldn't we be in a terrible mess if we let our land wash away or blow away and lessen our capacity to produce food? Do we want any part of the United States ever to get as bad as the deserts to be seen in Saudi Arabia or Pakistan or India, to mention only a few that are glaring examples of poor land use and neglect?

In consideration of all this it must be remembered as Don Williams, SCS administrator, told some interagency groups this spring that, *"Our growing country must continue to be supported from our present agricultural land."*

This is important when we realize that cities, highways, factories, airports, parks and suburban developments occupy 115 million acres of land, much of which once was our best agricultural land. This encroachment of cities, suburban residences and factories on farm land is continuing.

Then, too, erosion is still proceeding at a serious rate on about 200 million acres of crop land in the United States which includes both wind and water erosion. In addition, some of our very fertile bottomland is subject to flooding and some of the western irrigated lands have been damaged by waterlogging and salinity.

All this adds up to the fact that our problem of proper land use and conservation is nationwide and that we have need to use our crop acreage wisely today so that we may have a reserve to dip into if and when farmers are called on to meet increased food demands.

It's expecting too much for the SCS, the soil conservation districts, the extension service, the ACP to carry the whole load of getting a proper land use program into effect until we approach the problem from a much more positive and a broader viewpoint.

Whether we do it by purchase or by rental, whether we do it by incentive and education or by more direct measures, whether we call it a soil fertility bank or a soil conservation acreage reserve idea, we need to quit subsidizing poor land use and adopt a national policy of proper land use—a policy of using land for the purpose for which it is best suited.

We know how to prevent dust bowls, but we need to do something to put into practice the things that we know. And first and foremost is how to get back into grass and keep in grass some of the land now under cultivation that never should have been plowed up in the first place.

Our Wasted Investment in Rural Zoning Education

J. EDWIN BECHT

The people of the United States, through their government, schools, civic organizations and individual efforts, have invested literally millions of dollars and unmeasurable time in "rural zoning education." By 1938 considerable progress had been made toward the establishing of sound rural zoning legislation throughout the country, but now interest in, and support for, rural zoning has waned; and much costly and time-consuming re-education will be required before the public will again recognize the need for zoning laws designed to govern uses of agricultural, grazing and forest problem lands. Until we do establish sound rural zoning laws and policies, points out the author, we will have to continue paying for roads, schools and relief in destitute areas and for price supports nearly everywhere. In turn, he further emphasizes, price supports only prolong the misuse of our marginal and submarginal agricultural lands.

AT THE PRESENT TIME federal farm price supports and disaster funds are temporarily bolstering the economies of many areas in the United States. In spite of our current over-all prosperity, there are areas of tax delinquency, poor markets, job insecurity and general low living standards, all of which promise to become even more severe during periods of economic recession. In past depressions, especially in the period 1932 to 1938, conditions became so acute that it was necessary for the federal, state and county governments to take emergency steps to provide for the very sustenance of life. However, in spite of this national experience with marginal and submarginal lands, no over-all land-use policy has been forthcoming to prevent a need for the repetition of such drastic measures.

Even when times are good for the nation, there are sections of the country that remain submarginal. However, it has been demonstrated, in Oneida County, Wisconsin and elsewhere, that through rural zoning a long-range economic development more consistent with the physical capabilities of the land can change former areas of distress into financially sound areas. Though rural zoning is not synonymous with land planning, it is a social instrument for giving effect to those plans. Hence, in order to estimate the total national effectiveness of what land programs may be tried in the future, a knowledge of rural zoning legislation is essential. Such information is especially timely in view of recurring reports of rural

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areas suffering from unemployment, too much water, a lack of water, and/or dust bowl conditions. Many of the states containing these marginal and submarginal areas have failed to enact even "stand-by" rural zoning laws.

Rural Zoning in Wisconsin

Rural zoning as it has been adopted in Wisconsin should be elaborated upon here for it explains what is meant by the term. Wisconsin was the pioneer state, or what might better be termed a testing ground. Wisconsin's county zoning enabling act was passed in 1923, making it, along with California, a pioneer state in providing, by law, for rural zoning. Originally the law was designed to permit the county to regulate suburban territories but to meet the land-use problems of the northern "cut-over" areas, the first enabling act was amended in 1929 to permit any county board in the state to determine the areas within which agriculture, forestry and recreation might be conducted. This was new in zoning because it permitted the restriction of the uses of poor lands as well as high value city property (1). As a result, during the height of the 1930-1938 depression, Oneida and other counties were empowered to prohibit scattered settlements in "cut-over" lands—thus avoiding much additional distress and poverty.

Today, Wisconsin's rural zoning laws are entirely as comprehensive as the urban restricting laws. Counties in Wisconsin may now determine heights of buildings, location of schools, size of yards, courts, and open spaces, also density and distribution of population, setback building lines, and uses of water from natural resources. Not all *of the county ordinances in Wisconsin contain* all *of these features, but the enabling acts have been provided so that each county has the means with which to do what it deems necessary.*

Historical Background

The situation that resulted in the present pattern of rural zoning acceptance and adoption has been developed ing for a hundred and fifty years or more. The economic distress areas indicated on the accompanying map are well-recognized, long-time rural problem areas. In most cases, distance from market is an important handicap retarding their satisfactory development. This is true because in the early period of our national settlement, the advantage of location was not as important a factor as it is today. Instead, ease of clearing hill-lands, proximity to building materials, water, and water transportation, and a desire to avoid heavily sodded prairie areas, were far more important factors determining the location of settlement in New England, Southern Illinois, Southern Indiana, and Ohio, as well as parts of the Appalachians and Southeastern United States. As a result, many early settlements and farms in the United States were founded in regions with too poor a physical resource base to sustain them indefinitely.

Communities were established in the Lake States based on seemingly endless forest. There, the destruction of timber, on soils unsuited to agriculture, resulted in the distressed regions of northern Michigan, Wisconsin and Minnesota. Farther west, a "cyclic-climate" combined with an inadequate homestead law and abnormal wartime agriculture markets to encourage farming in regions of transition between humid and arid lands. A series of dry years in the late 1920's and early 1930's resulted in the destitute families of the West. In other areas the effect of one crop farming on the soil, resulting in erosion, caused other islands of poverty stricken families. In the main, there was no system directing early settlement in the United States. Personal whim, ambition, railroad grants and construction, and a will to homestead were the major forces directing land settlement. It is not surprising then, to find blight areas in the United States—even with our present prosperity—constituting problems of national importance.

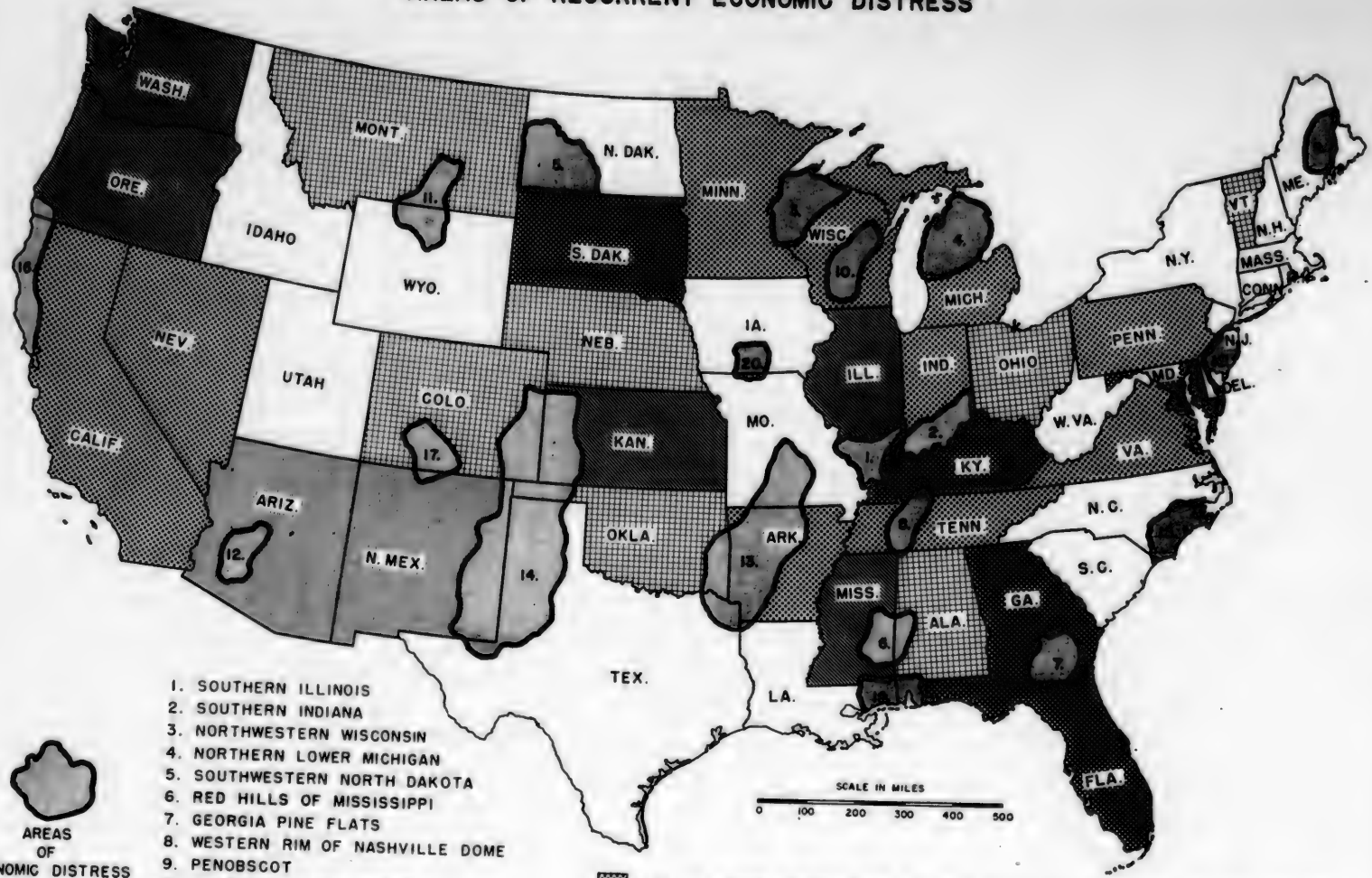
Prior to the "New Deal Era" only indirect forms of rural zoning had been practiced. Reservation and long-range management of national forests, purchase of lands by both federal and state governments for forest development, forest nursery, research and fire-control work and controlled grazing on public lands were all forms of planned land-use. State and National parks, Indian reservations and wildlife refuges made up additional types of restricted areas. Collectively, these illustrated, even prior to the Oneida County experiment in Wisconsin, that the proper control of rural land-use could insure a sustained profitable or rewarding kind of land-use.

The big step that remained by 1932 was the acceptance by the general public of the concept that under certain conditions it was wise and justifiable to resettle white persons. Planned restrictions aimed at zoning marginal and submarginal lands from future settlement, and the ousting of families unable to to exist without public aid, or unable to pay tax assessments, constituted a new step in the history of our nation. Use of police power has been sanctioned in cities since 1885(13) but its application to rural areas dates only from 1923(7).

By July, 1954, 29 states had some form of rural zoning and over 40 states sponsored one or more planning groups. However, there are only 14 states that have rural zoning laws which apply to agriculture, grazing, or forest land-use; and, even in these states, most counties do not enforce rural zoning laws other than for purposes connected with airport and highway construction.

Rural zoning legislation falls into five general categories (see map). These are: 1) states having county enabling acts that provide for agriculture, grazing or forests (ten states); 2) states having specified county enabling acts that provide for agriculture, grazing or forests (five states); 3) states having county enabling acts that

RELATIONSHIP OF RURAL ZONING LAWS TO AREAS OF RECURRENT ECONOMIC DISTRESS



AREAS OF ECONOMIC DISTRESS

1. SOUTHERN ILLINOIS
2. SOUTHERN INDIANA
3. NORTHWESTERN WISCONSIN
4. NORTHERN LOWER MICHIGAN
5. SOUTHWESTERN NORTH DAKOTA
6. RED HILLS OF MISSISSIPPI
7. GEORGIA PINE FLATS
8. WESTERN RIM OF NASHVILLE DOME
9. PENOBSCOT
10. GLACIATED SAND REGION
11. BIG HORN BASIN
12. SALT RIVER VALLEY
13. OZARK-OUACHITA
14. SOUTHERN HIGH PLAINS
15. NORTH CAROLINA COASTAL SECTION
16. NORTHERN CALIFORNIA REDWOODS
17. SAN LUIS VALLEY
18. NEW JERSEY PINE BARRENS
19. ALABAMA-MISSISSIPPI COSTAL PLAIN
20. APPANOOSE COUNTY

STATES HAVING COUNTY ENABLING ACTS THAT PROVIDE FOR AGRICULTURE, GRAZING, OR FORESTS.

STATES HAVING SPECIFIED COUNTY ENABLING ACTS THAT PROVIDE FOR AGRICULTURE, GRAZING, OR FORESTS.

STATES HAVING COUNTY ENABLING ACTS THAT DO NOT PROVIDE FOR AGRICULTURE, GRAZING, OR FORESTS.

STATES HAVING COUNTY ENABLING ACTS PROVIDING FOR ZONING ONLY IN CONNECTION WITH AIRPORTS.

STATES PROVIDING FOR ZONING ONLY IN CONNECTION WITH WATER DISTRICTS.

COMPILED: J. EDWIN BECHT

DRAWN: J. RAY 10/7/54

do not provide for agriculture, grazing or forests (five states); 4) states having county enabling acts providing for zoning only in connection with airports (seven states); and, 5) states providing for rural zoning only in connection with water districts (two states).

Forces Resulting in Acceptance of Rural Zoning

Manifold factors played an important role in the speed-up of the adoption and acceptance of "rural zoning" between 1932 and 1938. No small part was played by research efforts on the part of foresters, geographers, sociologists, soil conservationists, land grant colleges, experiment stations, and a host of land planners. The work reached into every state, and into most counties. A vast and widely distributed literature resulted from this work. Many mediums were used to reach the public, among them were scientific journals, popular magazines, government publications, and novels.

In non-depression times young people leave rural areas of limited employment opportunities for cities, the armed forces, or wherever jobs might attract them. The impact of the depression years, beginning in 1929 and lasting into 1938, was to cut off many outlets previously open to excess farm population(6). A direct result was the establishment of over 600,000 new farms in the United States in the five years from 1930 to 1935(5). Most of these, by the very nature of the land market, were in marginal and submarginal areas. As the agricultural market was already saturated, established farmers on more productive sites were better able to maintain themselves by the volume of their yields alone. Even in relatively prosperous times up to 1940 the less productive half of our farms produced only about a tenth of the marketed crops(16); therefore, these poorer farms were handicapped, even before the depression, and the opening of new farms on poor sites only accentuated the lower income portion of the farm structure.

During depressions, part-time farming that is tied into industrial or mining employment is no longer able to carry the full burden of a family when agricultural employment fails. Thus, when these workers have to rely more and more on agriculture their yields further oversupply an agriculture market already reduced by urban unemployment and loss of an export market. Furthermore, up until World War II, increases in farm population had been greater in the poorer than in the more prosperous areas. As of 1938 only about half of approximately 400,000 young men reaching maturity on farms each year were needed to replace older workers who died or retired.

Totaled, the above factors produce the distress areas that call for "rural zoning" to prevent their becoming more acute and spreading into more and more lands lacking the necessary physical resources to sustain high living standards. As might be expected, the tax-delinquent lands are usually the most unproductive lands; and, it is tax delinquency that is the most important factor awakening "outsiders" to the needs of these problem areas(2). For it is the "outsiders'" taxes that must necessarily provide relief, roads, and schools for these areas. In fact, if it were not for tax delinquency, the need for rural zoning would not constitute anywhere near the nation-wide problem that it is today.

In the 1930's government programs aimed at economic recovery were factors furthering the adoption of rural zoning. The Agriculture Adjustment Act, soil conservation program, Civilian Conservation Corps, Farm Credit Administration, rural resettlement program, Bankhead-Jones Farm Tenant Act, and agricultural extension work all served to emphasize a need for controlled land utilization.

The Agriculture Adjustment Act, approved May 12, 1933, was headed by an administrator in charge of four operating divisions: production, processing and marketing, finance, and information and publicity. All four sections encouraged the desertion of poor areas. Production quotas, based on previous yields rather than area alone, favored the more prosperous farm areas. Processing and marketing were by necessity concentrated in regions of greatest production. Farm credit, though easily obtained, was denied farmers whose physical plants were obviously incapable of returning a loan(14). This increased the economic distress both in comparison and in actual position for it made it impossible for them to compete with better equipped farmers who were supplied funds for the purchase of fertilizer, stock animals, and high grade seed. Appropriations for information and publicity served to point out the cause and effect factors, and, in the main, favored resettlement.

Particularly effective in "rural zoning education" during the thirties were the agricultural county agents and Soil Conservation Service personnel. These representatives sponsored educational meetings at which the principles and practices of more effective erosion control were discussed, publications were distributed, demonstrations were established on individual farms, and tours were arranged. In fact, many of the tours were conducted through the poorer areas as object lessons in poor farming practices! County agents, with the help of their 4-H club programs, directly influenced over 5,000,000 families in 1937(8). Doubtlessly they passed lessons and comments on to millions of other families.

The Bankhead-Jones Farm Tenant Act (passed in July 1937), though initially designed to relieve the worst forms of farm tenancy, was directed at "the retirement of land too poor for farming(11). The act, administered by the Tenant Purchase Division of the Farm Se-

curity Administration, also provided money for research. The result of this research, in conjunction with the Great Plains Committee, resulted in the development of techniques for land classification which was a necessary step before rural zoning could be made effective—just what economic activity, if any, should be carried on in an area first had to be determined(9).

The Resettlement Administration was established by President Franklin D. Roosevelt's executive order on April 30, 1935, under authority conferred by the Emergency Relief Appropriation Act of 1935(10). By 1937 more than 11,000 families stranded on land where they could not make a decent living had been provided with new homes(12). Though only 119 projects were ever completed, it established a procedure for taking care of those ousted from their places of residence—one of the most difficult problems connected with rural zoning.

Throughout this entire period state and national forest administrators worked at consolidating existing forests. Tax delinquent lands adjacent to the forests were absorbed to the limit that appropriations could be secured. Also, state and federal governments took over submarginal areas in order to take advantage of low prices and to provide work for the Civilian Conservation Corps(3).

Since 1938 the only statewide rural zoning laws adopted have been to provide counties with rural zoning laws concerning airports, building lines and highway construction. Seemingly interest in land zoning for agriculture, grazing and forestry uses has waned even though the need for such legislation is as great as ever.

Forces Retarding Adoption of Rural Zoning

Rural zoning has far from been adopted by all the states. First of all, there are problems and factors that precluded all state legislatures from passing county enabling acts. For example, there are many states in which distress areas are non-existent or so small as to be only a slight drain on the balance of the taxpayers. It is not expected that these states consider land control legislation. However, it should be stated, parenthetically, that there are states containing large areas of poor lands and peoples that have not considered zoning laws. In other states, such laws have been considered but defeated.

Fears that individual freedom will have to be sacrificed is perhaps one of the leading causes for failing to consider or to pass zoning ordinances. Some families might have to move and many people, perhaps justifiably, feel that they might be the ones sacrificed in order that others might become solvent. Attachment for "the land" has long been recognized as a powerful motive in human conduct; and, part of our cultural heritage has included respect and sympathy for those wishing to live in a location of their choice. It is human and natural for persons who find themselves on lands, once prosperous, but now poor, due to early settling of comparatively small farms or soil depletion, to be unable to view their situation objectively. A general recognition of this results in a feeling that the cost of resettlement, both physically and spiritually, might not be worth the effort.

Administrative details, by the very scope of the problem, constitute further difficulties. Is the planning to be on a local level with authority from below? Or is control to be vested in the source where funds are most likely to be forthcoming, namely, State or Federal agencies? A lack of data with which to substantiate theories, or to convince legislators acts as a brake. Should work be on a blanket scale, or planned step by step? Who are logical leaders, and directors for such land utilization plans? Satisfactory answers to all these questions have to be provided or developed prior to the passage of new or revised rural zoning laws(17).

Other very sound and logical arguments against restricting lands include the arguments that with our current prosperity tourists and hunters, increased lumber prices, or higher returns on grain through price supports will offset any future depression years (such contentions are very difficult to disprove). How much land can be taken out of production and still provide sufficient taxable wealth? What assurance is there that resettlement is a solution(4)? Objections and arguments are numerous, and help to account for the failure of many states to pass zoning legislation. Some accusations were made in the past to the effect that certain legislatures feared loss of "pork barrel" appropriations, hence voted down laws that would provide permanent relief(15). Also, in addition to the above factors, there is the difficulty of overcoming custom and legislative inertia. All these factors combined have resulted in the failure by many states to adopt much-needed rural zoning legislation.

Conclusions

Effective statewide "rural zoning" laws have been adopted by only fourteen states. In only six of these (Minnesota, Wisconsin, California, Tennessee, Georgia, and Florida) have counties established effective programs utilizing these laws. Thus, it is clear that many of the states which have the greatest need for rural zoning lack adequate laws to cope with their agricultural, grazing, and forest land-use problems. Most rural zoning laws currently listed in the statutes were adopted and accepted during the years 1932-38. By 1932 sufficient pioneer work in Wisconsin, reports by federal committees, and recommendations by state and county planning groups provided patterns of concrete corrective steps that could be followed to improve economic conditions in areas of limited physical resources. However, by 1938

(*Continued on page* 202)

The Coon Valley Watershed Project — A Pioneer Venture in Good Land Use

H. O. HENDERSON AND I. O. HEMBRE

"COON VALLEY, nestled in the valley of the Coulee Region of western Wisconsin, is a historic shrine of modern soil conservation. The Coon Creek project was the first large scale soil and water conservation demonstration ever carried out by man," says Dr. Hugh H. Bennett, former chief of the Soil Conservation Service.

It is very significant to note that at the time Hugh Bennett was championing the cause of a wiser and more stable use of our natural resources at the national level that similarly minded devoted conservationists were at work in many states. One of these groups led by Noble Clark, Associate Director of the Experiment Station of the University of Wisconsin, was giving serious thought to an improved approach to good land use in Wisconsin. The establishment of the Erosion Control Experiment Station at LaCrosse in 1932, is evidence of the interest and eagerness of this group to cooperate in the Federal Soil Conservation program. The states furnished the land, and the United States Department of Agriculture the personnel and equipment in the development of these stations. The programs of work were jointly planned and evaluated. This much needed research work was the outgrowth of Dr. Bennett's spirited soil conservation leadership in the early 1920's which was featured through articles in the leading magazines entitled a "Call to Arms."

In 1933, President Roosevelt initiated the Civilian Conservation Corps (CCC), to relieve the idle youth problem in the larger cities. At first CCC Camp activities were principally devoted to forestry projects. The leaders in the Conservation movement in Wisconsin, through the cooperation of the late U. S. Senator Robert M. La-Follette, Jr., got an amendment to the CCC Act, which added erosion control as a possible activity to CCC camp programs and permitted work on public lands. Among the leaders from this state who sponsored this cause were former Governor A. G. Schmedeman, Director Noble Clark, Aldo Leopold, chairman of Wildlife Management Department, George Wehrwein, Department of Agricultural Economics, and E. R. Jones, chairman, Department of Agricultural Engineering, all of the University of Wisconsin. Professor Leopold was also one of the commissioners of the State Conservation Department. The CCC camps in the state were at that time under the direction of Noble Clark. He was very ably assisted by Professors Leopold and Jones, and the Soil Conservation Specialist of the College of Agriculture, Otto R. Zeasman.

It was natural that R. H. Davis, the first project supervisor of the Erosion Control Experiment Station at LaCrosse, found a very receptive response from this group of Wisconsin conservation leaders when he, in the summer of 1933, approached them on the need for a soil conservation demonstration project in southwestern Wisconsin.

The "Tentative Program for the control of erosion on the Watershed of Coon Creek in Southwestern Wisconsin, upper Mississippi Region," is an historic document.[1] It was prepared in 1933 by Mr. Davis, Director Clark, and members of the Station staff—notably, Professors Leo-

[1]Copies available through State Soil Conservation Committee, 202 Agricultural Hall, University of Wisconsin, Madison 6, Wisconsin.

Figure 1. This is a view of the Civilian Conservation Corps Camp. The village of Coon Valley is shown in the background.

H. O. Henderson is agricultural economist for the Agricultural Research Service. His headquarters are in LaCrosse, Wisconsin. I. O. Hembre is soil conservation educational leader, State Soil Conservation Committee, College of Agriculture, Madison, Wisconsin.

pold, Jones and Wehrwein. A few paragraphs taken from this program plan developed by them is of interest.

"An erosion control program to be effective must recognize and reconcile (1) the private ownership of most eroding land, and (2) the public nature of the considerations which require that erosion be prevented and checked.

"Effective erosion control requires the close cooperation of the land owner and the government. This must be on a basis which recognizes not only the American tradition of property rights in land, but also the new concept that public welfare requires a greater degree of social control over private enterprise in industry, in agriculture, and in land use. Such control will not necessarily be of the "strong arm" type. On the contrary it will be most successful when it is able to win the greatest amount of cooperation from the land owners.

"It is proposed on each sample area:

(1) to map the farm and draw up plans for reorganization of the physical lay-out so that each acre will be devoted to the crops which it can produce without causing serious soil loss;

(2) to adjust the land-use practices so as to accord, with existing facilities, for utilizing farm products, such as livestock, so that the local economic mechanism will not be unduly disturbed;

(3) to install certain improvements, such as dams, strip cropping, terracing and planting trees and other forms of vegetation;

(4) to erect fences for protection of areas devoted to forests and pasture, to conform to the new lay-out;

(5) to contract with the owner to permit putting into operation certain specified erosion control practices, which he will agree to maintain for a period of five years in return for compensating advantages offered by the Government.

"Here agriculture and erosion face the necessity of living together. A balance can be maintained, and erosion kept from securing the upper hand, if farming is carried on in such manner as to encourage the growing of sufficient protective vegetative cover; and if we recognize frankly that it is not possible for the Government to cure erosion and also to sanction the private land owner in every assignment or use he has made of his land. In other words, erosion control is not a challenge to technical men to work out methods which will permit farmers to continue any and all present land uses. Rather it is a challenge to define and secure the basic changes in land utilization which must precede and accompany control works. We can not get very far on a plan which consists entirely of applying public palliatives to private abuses.

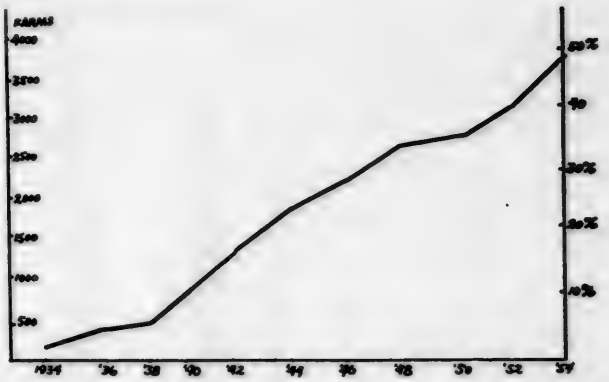


Figure 2. A steady increase in farmer participation in soil conservation district programs in La Crosse, Monroe and Vernon Counties.

"This does not mean that palliatives are not necessary. They are. We need strip cropping, terraces and soil-saving dams to back up better land utilization, to hold soil in place pending adequate revegetation, and to heal the injuries our agricultural operations have already caused. In the long pull, however, prevention is cheaper and surer than cure in the case of erosion, as with most other things.

"Some fields now being cropped will have to be given over to pasture. Thus the crop land margin will involve the poorer crop land—the land which from an economic standpoint should be the first to go out. This is in contrast to any plan of plowing under part of the tobacco crop, wheat crop, or other cash crops. Such crops are ordinarily grown on the most fertile fields of the farm —the fields that are easiest and most economically cropped, and that the farmer is naturally loath to see stand idle."

The Coon Creek project marks, somewhat arbitrarily perhaps, the beginning of a coordinated approach to the soil and water conservation problems of this country. Other similar projects—40 of them, in fact—sprang up within a few months.

In the Coon Creek project, ideas that had existed up to that time only in the minds of a few men, were put into action in 1933. Here was a testing ground for a great experiment in relations, man with man and man with his soil. Here was a test of how well people would cooperate with their government for the general welfare.

The Soil Erosion Service was first organized in the Department of Interior, but soon after, in the spring of 1935, it was transferred to the Department of Agriculture and re-named the Soil Conservation Service. This agency was established by strong personalities to meet a pressing problem.

The SES offered the farmer in Coon Creek, as well as in other project areas, a five-year plan, to be worked out cooperatively. If the farmer agreed to carry out the

conservation plan the technicians developed with him, the federal government agreed to furnish lime, seed, fertilizer, fencing, labor (from CCC camps), and technical assistance. The farmer assumed the obligation of carrying on his program for five years in return for this assistance. The SES justified these outlays on the basis of the newness and urgency of the demonstration projects, and the low income state of farmers during that period. The policy of furnishing seed, lime, fertilizer, fencing and labor was discontinued after two years. From then on, only technical assistance in planning and applying soil conservation practices was provided by federal and state agencies.

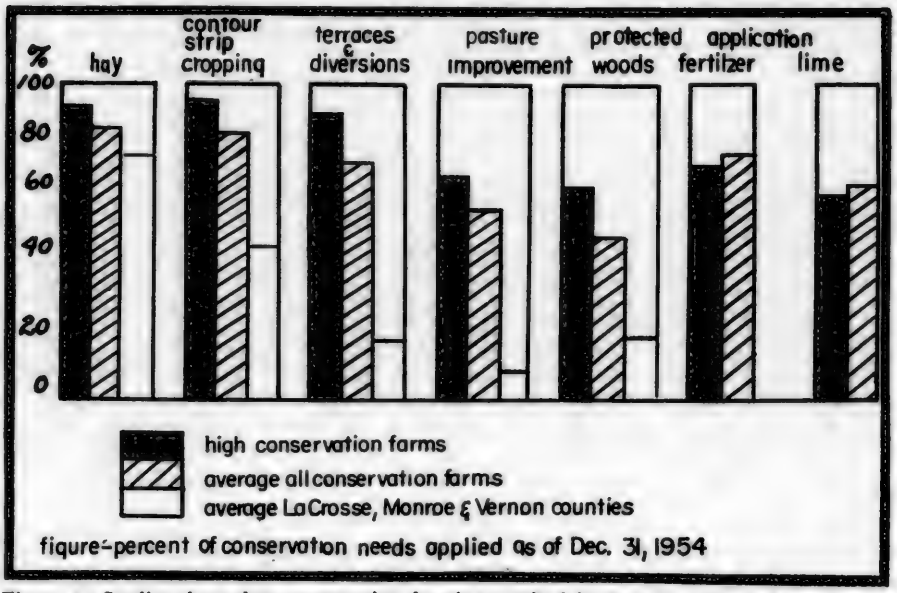


Figure 3. Studies show that conservation farming resulted in greater yields and production of farm products.

R. H. Davis was named director of the Coon Creek project. He now is in Formosa, as a member of a United States Commission assigned to that country. The first members of his staff included Herbert Flueck and Marvin Schweers, who now are state conservationists for the SCS in Minnesota, and Wisconsin, respectively; Jack Cummings and John Bollinger, both retired, and Joe Schaenzer, now with REA in Washington. Working with them were Jerry Reyerson, Project Engineer; Ernest Holt, Project Biologist; M. H. Cohee, Project Plans and Farm Management; Art Nelson, Project Soils Scientist; I. K. Landon, Project Agronomist. This list is far from complete. It names only a few of the men who were in on the development and completion of a project which has grown into a nation-wide program.

No historical account of the project would be complete without mentioning the contributions of farmers and business men of the community. Every one of the several hundred cooperating farmers who started Soil Conservation in those days was a leader—a pioneer in the task of saving the soil for continued production. Among some of the first were John Sund, Ben Einar, Joe Stromstad, George Nygaard, Oscar Ihle, Maurice Egstad, and Oscar Bakken. I. N. Knutson, Coon Valley banker, was one of the many businessmen who gave valuable leadership and service in the establishment and support of this project. A goal of active participation in the soil conservation program by more than one-half of the farmers in the watershed was reached in the spring of 1936, when agreements had been signed by 413 of the valley's 800 farmers.

The good teamwork that prevailed in the formative years of soil conservation work in the state is continuing today in Wisconsin as well as in other states. In Wisconsin it set a pattern for the personnel make-up of the State Soil Conservation Committee which was created in 1937. The Wisconsin State Soil Conservation Committee is made up of the Assistant Director of the Experiment Station, R. J. Muckenhirn; the Associate Director of Extension, H. L. Ahlgren; and three farmers, George Nygaard, Orrie Shiffer, and Harry Schuyler, appointed by the Governor, with M. F. Schweers, State Conservationist, SCS, as an advisory member. It has a staff consisting of an executive secretary and three field men assisting in soil conservation education activities throughout the state. Under State Committee leadership, 67 of the 71 counties in the state have very active, progressive and well balanced programs of soil and water conservation.

In servicing the districts in their program of work the technical assistance is supplied by the Federal Soil Conservation Service, and the responsibility for the educational activities rests with the Agricultural Extension Service. The accomplishments in the state and district programs in Wisconsin, and in other states, is an everlasting tribute to the fine teamwork between these two agencies of the United States Department of Agriculture. Special recognition should be given the quality of service and the devotion of the staffs made available to the local districts in accomplishing the objective of a new pattern of good land use throughout the nation.

Within these districts, other state and federal agencies, among them the State Conservation Department, the Forestry Service, the Department of Public Instruc-

tion and the schools of the state, Vocational Agriculture, the Farmers' Home Administration, Agricultural Stabilization and Conservation Service, also are a part of the team on the important job of soil conservation.

The growth in the number of conservation farmers and in application of conservation practices has continued. From the early cooperators, the work spread throughout the community. From Coon Valley, it spread throughout southwestern Wisconsin, so that now it is among the outstanding conservation showplaces in the country. It might have been with some element of forgivable self-satisfaction that Dr. Bennett, when touring the area on Highways 14 and 33 in the midst of the harvest season of 1953, commented, "The most beautiful sight I've ever seen."

The Coon Creek Erosion Control Demonstration Project area is located in three counties and a part of the three county soil conservation districts. A steady increase in soil conservation cooperation is shown throughout the years of operation of the three districts. By December 31, 1954, 3,670 farmers had accepted soil conservation plans for their farms. About 55 per cent of the farmers in LaCrosse and Vernon Counties and 35 per cent of the Monroe County farmers are soil conservation district cooperators.

A study of farms 20 years after the adoption of soil conservation plans in the Coon Creek Project show that more progress has been made in the application of certain conservation practices than in the adoption of other parts of the conservation program. Studies further show that well planned cropping systems, contour strip arrangement and well constructed terraces fit well into the farmer's crop production program. Farmers follow contour strip cropping and terracing plans quite well. The studies also show that practices such as pasture renovation come more slowly even though very highly profitable. They also indicate that farmers may be reluctant to purchase the needed lime and fertilizers when prices of farm products are low, even though increased use of these would add to the farmers' net income.

Even the average conservation farmer has advanced considerably above the average of all farms in the three counties. This is especially true of practices such as contour strip cropping, terracing, pasture improvement, and protecting woodlots. While they have added more legume hay to their rotations, they have not advanced too far above the average in this respect for all the farmers in the counties.

Experiences of the farmers in the Coon Creek Project as well as carefully controlled experiments have shown that crop yields are improved when an extra year of legume hay is added to a corn-grain-hay rotation. Experiments also have shown that yields are increased when soil and water losses are reduced through the use of practices such as contour strip cropping and terracing. Comparisons between a group of farms in the area with high conservation ratings and a group of farms with inadequate erosion control show that corn and oat yields were 21 per cent and hay yields nine per cent higher for the former group than the averages for the latter. Much of these differences in crop yields between the two groups were due to the differences in soil management of which soil and water conservation practices were an important part.

Table 1. Crop Yields Per Acre and Total Digestible Nutrient Production Per Farm, Average 1945-46 In Coon Creek Area.

	High cons. farms	Low cons. farms	Difference
Corn grain, bu.	55.0	46.0	9.0
Corn silage, tons	10.2	8.3	1.9
Oats, bu.	47.0	39.0	8.0
Tobacco, lbs.	1700.0	1501.0	199.0
Hay, tons	2.4	2.2	.2
Total digestible nutrients, 1,000 lbs.			
Grain	31.9	25.4	6.5
Hay	49.0	44.0	5.0
Corn silage	29.2	23.7	5.5
Renovated pasture[1]	7.8	—	7.8
Total for farm	117.9	93.1	24.8

[1]Estimated increase in nutrients from 6 acres of renovated pasture.

Improvement in crop yields can be expected to be reflected in increased livestock production. The 1946 study in the Coon Creek area showed that conservation farming, with the emphasis on hay and pasture improvement, resulted in greater dairy production on the high conservation farms. Larger yields per acre of corn and small grain also made possible greater hog and poultry production in spite of slightly reduced acreages of these crops.

Table 2. Livestock Production, 1945-46 in Coon Creek Area.

	High cons. farms	Low cons. farms	Difference
Butterfat sales, lbs.	4,569	3,780	789
Cows, no.	20	17	3
Cattle sales, lbs.	4,660	4,080	580
Hogs, lbs.	4,200	1,040	3,160
Eggs, dozen	999	486	513

The average gross livestock income for 1945-46 on the high conservation farms was 36 per cent greater than that of the group with less adequate erosion control. This was offset in part by the larger cash crop sales, principally tobacco, by farmers in the latter group. The average total cash income of the high conservation farms was 10 per cent above that of the low conservation farms. In 1950, dairying provided about two-thirds of the gross farm income in these counties. Cash crops such as tobacco, canning peas and livestock sales accounted for about 30 per cent and poultry about five per cent.

Expenses more or less directly associated with the soil conservation program (crop production expenses and feed purchases) were $238 higher for the high conservation

Figure 4. The Elmer Manske farm, Coon Valley, Wisconsin. This is one of the first farms to sign up and the first one to have terracing done. Mr. Manske says, "I have reclaimed fields which were lost due to gullies. Soil losses are controlled, crop yields are much better. I would not go back to the old system of farming."

farms, thus leaving a net advantage in adjusted gross income of $407 for that group. This advantage in gross income comes largely from improved crop and pasture land management which in turn results in greater livestock production and higher income.

Table 3. Income, Livestock and Miscellaneous Production 1945-46, Coon Creek Area.

	High cons. farms	Low cons. farms	Difference
Dairy	$4,121	$3,432	$689
Hogs	587	145	442
Miscellaneous livestock	124	60	64
Eggs	350	170	180
Crops	1,367	2,167	—800
Wood Products	265	195	70
	$6,814	$6,169	$645

As this is being written, plans are being made for the dedication, on July 19, 1955, of a roadside parkway with a historical marker, near the original site of the CCC Camp, west of the village of Coon Valley. The parkway is being provided by the Wisconsin Highway Commission, and the historical marker by the State Historical Society. The dedicatory program is being planned by people of the three Soil Conservation Districts, Vernon, Monroe and LaCrosse Counties, in cooperation with the local state and federal conservation agencies, all of whom have played an important part in the advancement of conservation in the area.

Dr. Hugh Bennett is to give the address of the day. Harold Plummer, chairman of the Historical Markers Division, will dedicate the plaque and roadside parkway.

The marker designating the Nation's First Watershed Project reads as follows:

"This point is near the center of the 90,000-acre Coon Creek Watershed, the nation's first large-scale demonstration of soil and water conservation. The area was selected for this purpose by the United State Soil Conservation Service (then Soil Erosion Service) in October 1933.

"Technicians of the S.C.S. and the University of Wisconsin pooled their knowledge with experiences of local farm leaders to establish a pattern of land use now prevalent throughout the midwest. Planned practices in effect include improvement of woodlands, wildlife habitat and pastures, better rotations and fertilization, strip cropping, terracing and gully and stream bank erosion control.

"The outcome is a tribute to the wisdom, courage and foresight of the farm families who adopted the modern methods of conservation farming illustrated here."

R. H. Davis, the first project director, paid high tribute to the cooperating farmers in this project when he said, "Cooperating farmers in the Coon Creek Watershed were real pioneers in conservation farming. They can be justly proud of the contribution they have made to the national soil conservation program. The historical plaque erected in recognition of the establishment of the Coon Creek Watershed project is a fitting tribute to an outstanding accomplishment. It is symbolic of what a free people can do on a voluntary basis working cooperatively with the agencies of their government—a fine example of democracy in action."

The steep uniform slopes of southwest Wisconsin are well suited to contour strip cropping. These strips on the Nordahl Moilein farm near La Crosse are typical of this major soil conservation practice.

Wisconsin Extends You a Cordial Invitation . . .

Members and friends who have not already done so should set aside the dates of September 12, 13 and 14 for the Tenth Annual Meeting of the Soil Conservation Society of America at Green Lake, Wisconsin.

A full slate of local committees are now working under the direction of General Chairman I. O. Hembre of Madison and the Annual Meeting Program Committee (*See page 208 for details*) headed by Russell G. Hill of East Lansing, Michigan. The program will include technical sessions . . . some field tours . . . special events for the women . . . children's activities . . . and fun and fellowship for everyone.

This year's annual meeting will be within the range of every SCSA member's financial means. Room and food at Green Lake are not only reasonable, but also convenient for members and their families.

Wisconsin has long been a leader in the conservation movement. SCSA members driving through the state will be impressed by the green rolling fields, contour strips, fine pastures and woodlands, wildlife areas

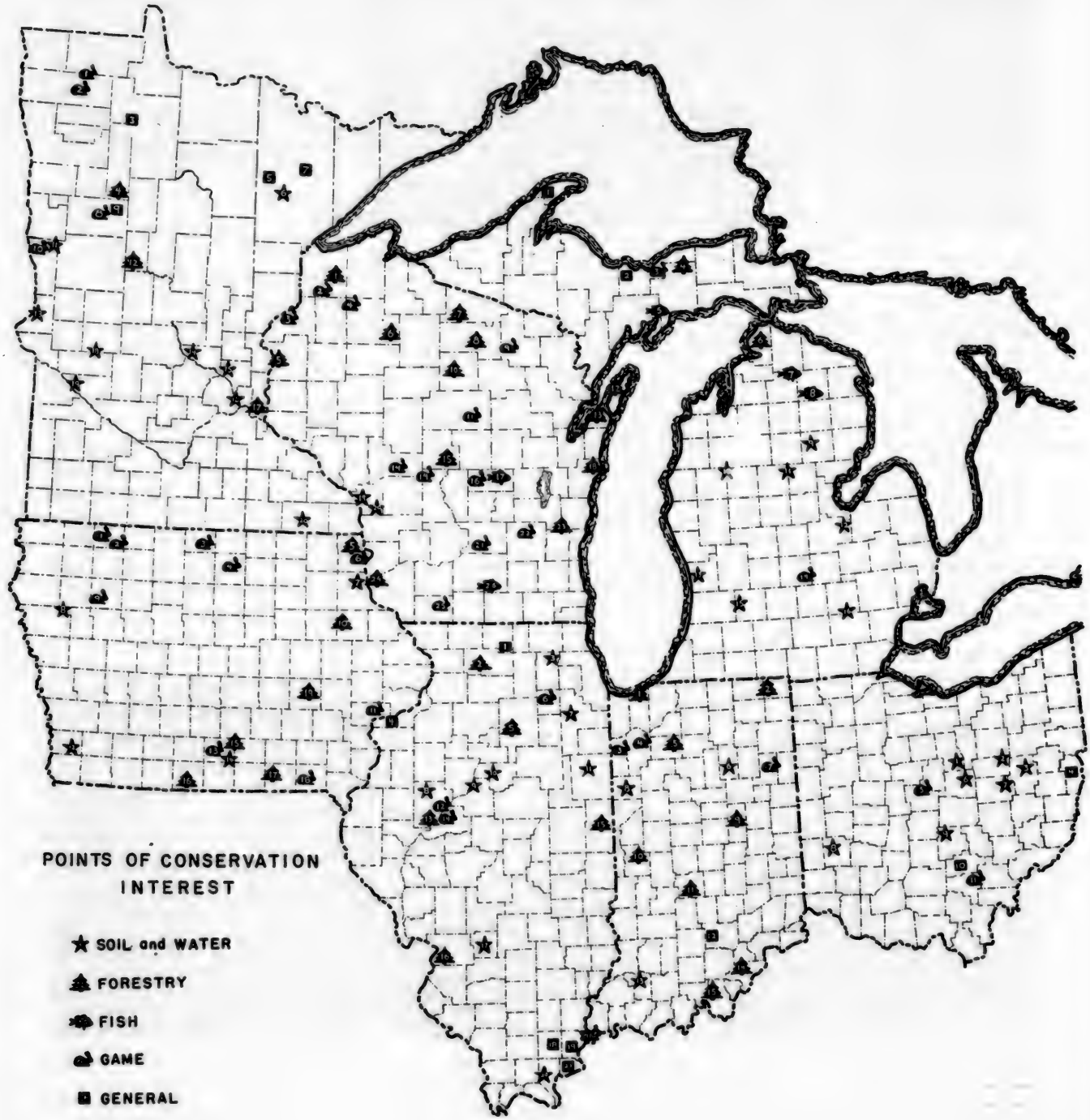
Dairying in Wisconsin and good conservation go together.

The rolling lands of Wisconsin require conservation practices.

Good fishing is always to be found in abundance.

and sparkling ponds that are an ever increasing source of water. All these have helped to make "America's Dairyland" strong and productive.

Nearby Green Lake is the site of the 90,000 acre Coon Creek Watershed, the nation's first large-scale demonstration of soil and water conservation. This site was recently dedicated as *"The Nation's First Watershed Project." Elsewhere in the state are many fine examples of modern conservation practices . . . all a tribute to the leadership of technicians representing the Soil Conservation Service, the University of Wisconsin and the courage, wisdom and foresight of the thousands of cooperating farm families.*



Conservation...Midwest Variety

Driving to the SCSA convention in Wisconsin this September? Why don't you make your trip a conservation tour. Here is a map showing some important points of conservation interest in the Lake States and their close neighbors. Of course these are only a few examples of these midwestern states' many attractions! But we offer this map as a preliminary guide to places you might like to visit on your way to or from the meeting, and also to areas you might observe just from the car window as you are driving through.

A symbol on the map designates a type of natural area, development or activity. Numbers refer to the legend for each state. Exact locations can be checked on individual state maps.

Our thanks go to Ruth L. Hine, Wisconsin Chapter, SCSA; also to representatives of the Soil Conservation Service and the state conservation departments of the states represented here for their help in contributing material for the map and legend.

SCSA members will be thrilled with Wisconsin's many beautiful lakes.

Legend for Map Showing Points of Conservation Interest

Minnesota

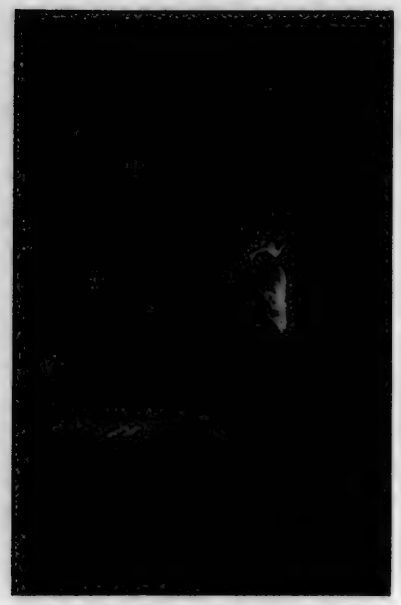
1. Thief Lake Refuge; E of Hwy 32.
2. Mud Lake Wildlife Refuge, Fish and Wildlife Service; E of Hwy 32.
3. Red Lake Indian Reservation; Red Lake's largest sawmill in Minnesota; Redby rearing ponds.
4. Itasca State Park; headwaters of the Mississippi River.
5. Open pit mines; Mesabi iron range; Hibbing.
6. Wilderness Farms; experiments on deep peat; S of Hwy 216 and W of Hwy 53.
7. Taconite development; Aurora, Hwy 35.
8. Tamarac Wildlife Refuge; W of Hwy 225.
9. Indian village; Ponsford.
10. Rothsay Slough wildlife development; Rothsay, Hwy 52.
11. Plowville—1955; Rothsay.
12. Saw mills; Wadena.
13. Mustinka channel improvement; Wheaton.
14. Field windbreaks and windstrip cropping; Hwys 10 and 52, SE of St. Cloud.
15. Vegetable farming on peat soils; Anoka.
16. St. Anthony Falls hydraulic laboratory; Minneapolis; head of Mississippi River navigation.
17. Bailey Nursery; SE of St. Paul; all nursery stock on contour with terracing; also along Hwy 61, field windbreaks and wind strip cropping.
18. Chippewa River tributaries and Hawk Creek watershed protection project (pilot).
19. Lac qui Parle project (Chippewa diversion floodway); Watson.
20. East Willow Creek pilot watershed protection project.

Iowa

1. West Okoboji Lake; fish and game area, ducks; Okoboji.
2. Spirit Lake and North End Inlet; fish and game area, ducks; 2 mi. N of Spirit Lake.
3. Rice Lake; fish and game area; ducks, pheasants; 3 mi. SE of Lake Mills.
4. Clear Lake; fish and game area, ducks.
5. Yellow River State Forest Reserve; 10 mi. N of McGregor.
6. Yellow River Forest areas; fish and game area, squirrels; 12 mi. SE of Waukon.
7. McGregor watershed protection project; retention reservoirs protecting town of McGregor; soil conservation work near Farmersburg.
8. Little Sioux flood control project.
9. Storm Lake; fish and game area, ducks.
10. Backbone State Park; 5 mi. SW of Strawberry Pt.
11. Muscatine Slough; fish and game area, ducks; 4 mi. SW of Muscatine.
12. Mule Creek pilot watershed.
13. State forest areas; fish and game area, quail, squirrels; 12 mi. NE of Chariton.
14. Honey Creek pilot watershed.
15. Lucas-Monroe State Forest Reserve; 10 mi. NE of Chariton.
16. Nine Eagles State Park; 12 mi. S of Leon.
17. Lake Wapello State Park; 12 mi. SW of Ottumwa.
18. State forest areas; fish and game area, quail, squirrels; 3 mi. E of Farmington.
19. Amana colonies; collective farming and wood-using industries; white pine plantations growing 656 bd. ft. per acre per year; Hwy 220 N of Hwy 6.

Wisconsin

1. Brule River State Forest; S of Hwy 2.
2. Douglas county grouse management area; 3 mi. N of Gordon, ½ mi. W of Hwy 53.
3. Crex Meadows flowage and game management area; NE Grantsburg on Hwy D.
4. Totogatic flowage; Hwy 27 N of Hayward.
5. Interstate Park; Wisconsin-Minnesota border at St. Croix Falls.
6. Flambeau River State Forest; S of Hwy 70.
7. Trout Lake, Vilas county; northern forest headquarters, nursery; first forestry efforts in Wisconsin.
8. Rhinelander; nursery, ranger station, paper mills.
9. Little Rice conservation area; W of Crandon.
10. Tomahawk; fire control headquarters; paper mills.
11. Nine-mile Swamp public hunting ground; SW of Wausau.
12. Peninsula State Park; near tip of Door county.
13. Potawatomi State Park; NW of Sturgeon Bay.
14. Central Wisconsin Conservation Area and Necedah National Wildlife Refuge; in Jackson, Monroe, Wood, and Juneau counties.
15. Griffith State Nursery; Wisconsin Rapids.
16. Greenwood goose refuge and public hunting ground; SE of Hancock
17. Wild Rose Fish Hatchery; Wild Rose Hwy 22.
18. Point Beach State Forest; N of Two Rivers.
19. LaCrosse Soil Conservation Experiment Station; located on bluffs over-



Ruffed grouse on a drumming log.

looking city. (Show-window of strip cropping—Hwy 33 between LaCrosse and Cashton).

20. Coon Creek watershed; nation's first large-scale soil and water demonstration project, approved in October 1933; SE of LaCrosse.
21. Experimental Game and Fur Farm, Poynette; Hwy 51.
22. Horicon Marsh Wildlife Area and National Wildlife Refuge; N of Horicon and E of Waupun.
23. Kettle Moraine State Forest; Campbellsport, Hwy 67.
24. Wyalusing State Park; where the Wisconsin joins the Mississippi.
25. Yellowstone Lake and public hunting ground; NW of Argyle on Hwy N.
26. Nevin State Fish Hatchery; S of Madison on Hwy D.

Illinois

1. Scenic drive; Hwy 2 from Dixon to Rockford.
2. White Pines State Park; natural stand of white pine, the farthest south in Illinois; W of Oregon.
3. D. Hill Nursery; junc. Hwys 31 and 72; one of 3 largest wholesale nurseries in country; formerly severely eroded; outstanding job of management has made tremendous improvement.
4. Farm machinery center of the world; Rock Island, Moline, East Moline, and Davenport.
5. Starved Rock State Park; one of the older and better known state parks in Illinois.
6. State game farm on north edge of Yorkville; large numbers of pheasants raised here.
7. Northeast Illinois Soil Conservation Research Station; conducting work on run-off, living mulch in corn, and channel-type terraces; Alt. 66.
8. Strip coal lands reclamation, Fiatt-Rapatee area; Hwy 97, N of Hwy 9 out of Canton.
9. Farm Creek and Fondulac flood control projects.
10. Mt. Pleasant and Roanoke watersheds; E of Peoria.
11. Surface drainage work; along Hwy 49 between Crescent City and Hwy 116. There is a formless flume along the highway approximately 6 miles north of Crescent City.
12. Rice Lake hunting and fishing grounds; U. S. 24.
13. Dickson Mounds Indian burial grounds; east of U. S. 24.
14. Chautauqua Wildlife Refuge, U. S. Fish and Wildlife Service; NE of Havana.
15. Kickapoo State Park; demonstrates one possible use of "strip mine" areas; good use has been made of lakes and ponds developed following mining activities; W of Danville.
16. Cahokia Mounds State Park; Indian mounds and relics; E of E. St. Louis off U. S. 40.
17. Contour orchard; junc. Ill. Hwys 140 and 127.
18. Oil activity; new field, high producing wells, community development; Eldorado.
19. Popcorn producing center; Ridgeway.
20. Dixon Springs Experiment Station; Hwy 146 at Dixon Springs.
21. Spar mining in Hardin county; 75-85% of spar used in steel and aluminum manufacture mined here.

Michigan

1. Copper country; mining, scenery.
2. U. S. Forest-Dukes Research Station; Emmet county.
3. Cusino Wildlife Research Station, Mich. Cons. Dept.; deer and forest game problems; near Shingleton.
4. Fox River watershed development project.
5. Thompson fish hatchery; Thompson.
6. Maple River watershed development project.
7. Pigeon River trout research area.
8. Hunt Creek trout research station; off Hwy 33.
9. Rifle River; watershed treatment, state and soil cons. district project; headwaters near Rose City.
10. Pine River watershed development project; NE Lake and NW Osceola counties.
11. Cedar River watershed development project.
12. Big prairie; pump drainage; 7,000 acres; Saginaw county.
13. Soil Conservation District nursery; SCD managed Land Utilization and county lands; sand dune control.
14. Rose Lake Wildlife Research Station; NE of Lansing, off Hwy 78.
15. Gun Marsh; controlled drainage and lake level stabilization.
16. Huron River watershed development project.

Indiana

1. Indiana Dunes State Park; Hwy 20.
2. Pokagon State Park; Hwy 27.
3. Beaver Lake prairie chicken refuge; Hwy 41.
4. Jasper-Pulaski game farm and preserve; Hwy 43.
5. Tippecanoe River State Park; Hwy 29.
6. Site of 1955 National Plow Match and Conservation Field Day (Sept. 14-17, 1955); near Wabash.
7. Wells Game Farm and Preserve; W of Hwy 27.
8. Fowler SCS demonstration project; Junc. Hwys 41 and 52.
9. Mounds State Park; Hwy 67.
10. Turkey Run State Park; E of Hwy 41.
11. Morgan-Monroe State Forest; E of Hwy 37.
12. Limestone quarries; Bedford, Hwy 37.
13. Flat Creek pilot watershed project; Hwy 61 S of Petersburg.
14. Clark State Forest and Nursery; W of Hwy 31.
15. Harrison State Forest; Hwy 62.
16. Hovey Lake Game Preserve.

Ohio

1. Malabar, Louis Bromfield's farm; on State Hwy 603, SE of Mansfield.
2. Outstanding examples of strip cropping all through this section of Tuscarawas, Holmes, and Coshocton counties.
3. The Muskingum Conservancy District; headquarters at New Philadelphia; 14 dams plus reforestation and other work; principally north of U. S. Hwy 40.
4. Intensive strip mining area north of U. S. Hwy 40 and E of Cadiz; Harrison and Jefferson counties.
5. Delaware public hunting and fishing area and farm game research area; few miles east of U. S. Hwy 23 north of Delaware. Experiments conducted on effect of various agricultural operations on game populations, and semi-wild propagation of cottontails, pheasants and quail.
6. C. D. Blubaugh's farm; outstanding farmer-conservationist; State Hwy 514, NE of Mount Vernon.
7. Research Hydrologic Station; 9 mi. N of Coshocton on State Hwy 621; one of the most basic research stations in the world, dealing with water and soil conservation.
8. The Miami Conservancy District; headquarters at Dayton, but U. S. Hwy 40 crosses two of the dams above Dayton.
9. The Upper Hocking pilot watershed project; just west of Lancaster.
10. A number of scenic caves in the Hocking county hills.
11. Waterloo public hunting area and experimental pheasant farm in Vinton county east of Athens. Public hunting and fishing area and an experimental farm where hybridization experiments with pheasants are being conducted, along with direct plantings of wild turkeys and Reeves pheasants.

A Nursery Helps Put Conservation on the Land

J. L. SCHWENDIMAN AND A. L. HAFENRICHTER

This is the story of a grass and legume production program in the Pacific Northwest. It is told by two eminent authorities who have spent more than twenty years carefully selecting and breeding new strains adapted to growing conditions in the states of Washington, Idaho and Oregon.

There was little interest in grass seeding or improved varieties prior to the conservation movement. Tests also showed that available grasses were inadequate on eroded soils and other problem areas. It was at this point that grass nurseries were established by the Soil Conservation Service to provide improved varieties for conservation needs and high production.

WELL ADAPTED HIGH producing grasses and legumes, developed through pioneering at Soil Conservation Service's Pullman nursery, are now abundantly available for the fertility and structure building phase of crop rotations in soil conservation districts of Washington, Oregon and Idaho.

From 0 to 2,000,000 pounds of improved grass seed produced annually is a short story of 20 years of this nursery work in the Pacific northwest. Farmers and ranchers can now plant 340,000 acres annually to hay, pasture, range or green manure seedings using improved varieties. They can do this with confidence, knowing that they are using adapted varieties specifically developed for conservation and high production on their farms. Today, certified seed of these improved varieties can be purchased in quantity at leading northwest seed or farm supply stores. The annual commercial production of improved grasses in the northwest now is:

Improved Variety	Pounds of Seed	Acres of Conservation Seedings Possible
Intermediate wheatgrass, P-2327	850,000	120,000
Whitmar beardless wheatgrass	7,500	1,500
Primar slender wheatgrass	55,000	7,000
Topar pubescent wheatgrass	10,000	1,400
Tall wheatgrass, P-2326	40,000	4,000
Bromar mountain brome	270,000	27,000
Manchar, smooth brome	950,000	160,000
Hard fescue, P-2517	35,000	7,000
Sherman, big bluegrass	70,000	16,000
Total Pounds	2,287,500	Acres 343,900

Prior to soil conservation movement, starting in the middle thirties, there was little interest in grass seeding or improved varieties. Early tests showed that available seeds were entirely inadequate for use on eroded soils, low fertility sites or other problem areas.

The Soil Conservation Service nurseries went into action. First, thousands of seed lots and plants were collected from:

1. Native vegetation
2. Foreign plant introductions
3. Exchange with other nurseries and experiment stations
4. Commercial sources

The next step was organization of a program for rapid development, testing and release of improved grasses in the Northwest. At Pullman and six outlying cooperative nurseries it became responsible for getting superior plant material into extensive production over a wide area. The system works like this:

Observational plantings of these materials are made either in the greenhouse, when seed is very scarce, or in the field. A possible conservation use of each grass, legume or woody plant is determined on the basis of information on its source, previous history, or relation to other known plants. Plants are then tested in use groups. These use groups in the case of new grasses are:

1. Rapid developing, short lived grasses primarily for use as green manure with annual or biennial legumes.
2. Rapid developing, long lived grasses primarily for use with perennial legumes.
3. Late maturing grasses.
4. Drought tolerant, long lived bunch grasses.
5. Drought tolerant, long lived sod grasses.
6. Vernal dominant dryland grasses.
7. Understory grasses with heavy root production.
8. Wetland meadow grass.
9. Sand stilling grasses.

Each group is planted in comparison with a commercially available grass of the same group. In each successive planting the best strains from previous nurseries are carried forward.

About five per cent of the plants grown in the original nursery are harvested. This provides seed for plot trials on the nursery which are again arranged by use groups. The best rapid developing, short lived grasses are tested in mixtures with red clover or sweetclover for green manure. The long lived, perennial grasses are tested in mixtures with alfalfa or Ladino clover for hay or pasture. The

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A. L. Hafenrichter of Portland, Oregon, is plant materials technician for seven western states.

Both men are members of the SCSA. They have worked together in the plant materials field—USDA Soil Conservation Service—for 20 years.

Figure 1. A foundation seed field of Manchar smooth bromegrass in a solid seeding on class III land in the foreground looking north to the Soil Conservation Service Nursery headquarters and some of the grass and tree observational plantings. This foundation seed of Manchar produced 700 pounds of clean seed per acre.

pasture trials can be expanded to four acre plots where production is measured in actual pounds of beef per acre.

Many of the outstanding grasses and other plants also go to row and plot tests in outlying cooperative nurseries. All of the perennial dryland bunch and sodgrasses are tried where conditions are similar to those encountered in dryland range areas.

Following adequate tests at Pullman and outlying cooperative nurseries the outstanding grasses are increased for use in field-scale planting trials in soil conservation districts. A field-scale planting trial is the extension of a nursery proven species or practice on the farm of a cooperator in a district. If the results from these farm plantings under actual use conditions support the nursery plot data, the grass or other improved species is ready for release. While all this has been going on, breeder's seed from the original planting has been expanded to foundation seed production pending release. The data is assembled and presented to the experiment station committee according to the respective state rules and regulations and if passed, the improved grass is named and released for certified seed production. Seed is made available to cooperators in soil conservation districts and through experiment stations to the respective State Crop Improvement Associations or other certified agencies.

During the test period and initial increase stages seed is made available to many other agencies such as the Forest Service, county agents, Smith-Hughes instructors, 4-H clubs, experiment stations, Agricultural Research Service and others to provide supplement data on performance in areas and under conditions which will supplement nursery plantings and field trials.

New Grasses for Use with Alfalfa

Intermediate wheatgrass, after six years of testing, was first cooperatively released for certified seed production in 1941 to Virgil Kleweno, a cooperator of the Pine Creek Soil Conservation District, Washington. Seed increase spread rapidly, now almost a million pounds of intermediate wheatgrass seed, much of it certified, is grown and used annually in the northwest. Every acre sown to grass seed is protected from erosion while providing seed for control on additional acres. From a scarce, high-priced, little-known grass, this new species has become one of the most widely used hay and pasture grasses in the northwest.

Manchar smooth brome—a highly productive, leafy, slow-sodding, northern type—was released in 1943 in cooperation with the Idaho Agricultural Experiment Station. A recent USDA crop report shows an annual production of 950,000 pounds. A large amount of this was certified and registered seed. All of the seed being produced has found a ready market with certified seed usually bringing a five cents per pound premium. Recent reports from an Alaska district show that Manchar is a good conservation grass there and will increase in demand.

Both intermediate wheatgrass and Manchar brome are important hay and pasture grasses with alfalfa.

Figure 2. *Top:* Intermediate wheatgrass in an alternate row planting with alfalfa for hay production in a plot trial on the nursery. Both Intermediate wheatgrass and alternate row seedings were introduced into the agriculture of the Northwest by the conservation nurseries. Intermediate wheatgrass is most widely used in mixtures with alfalfa in dryland hay plantings of the Northwest. *Bottom:* Bromar mountain bromegrass (*Bromus marginatus*) growing with sweetclover. This late-maturing, tall, leafy, newly developed grass variety is outstanding for use in sweetclover-grass conservation mixtures in the Pacific Northwest. A mixture of ten pounds of Bromar mountain bromegrass and five pounds of Spanish sweetclover seeded on a well-prepared seedbed resulted in the above stand. Bromar mountain bromegrass on a dry weight basis made up 21 per cent of the top growth and 62 per cent of the root growth in this conservation mixture.

Improved Grasses for Use with Sweetclover

What about grasses with sweetclover? An adapted grass seeded with sweetclover increases root production by 1,000 pounds per acre. Fifteen years ago grass was not planted with sweetclover. In fact, the use of sweetclover as a green manure crop was still being questioned. Whitman County is eastern Washington's richest and most fertile agricultural area; home of six soil conservation districts. Yet in 1936, prior to district organization, less than 2,000 acres of the county's 1,000,000 acres of crop land had ever benefited from a sweetclover green manure crop, and none of it with grass. Now, over 30,000 acres are being planted annually and most of it with grass.

Adapted varieties of grasses and sweetclover have been developed and proven in many field scale planting trials. **Bromar** mountain brome is best for the 18-inch + rainfall belt and **Primar** slender wheatgrass for the 16- to 18-inch rainfall areas. The best sweetclover variety, **Spanish**, was also a product of cooperative testing and release. It is still in short supply. These two rapid-developing grasses, **Bromar** and **Primar,** easy to grow and handle, are being widely used. Roy V. Peringer, of the Pine Creek Soil Conservation District, Washington, produced in one year 50,000 pounds of certified Brome seed on a 90-acre field.

Range and Dryland Grasses

Farmers in wheat-fallow and in range areas have also benefited from improved dryland grasses such as **Sherman** big bluegrass, a product of Pullman nursery and Sherman Experiment Station in Oregon, and from **Whitmar** beardless wheatgrass, a selection from native vegetation on the rolling Palouse hills. Either of these grasses, when well established and properly managed, will exceed crested wheatgrass in production in range seedings. Claude Meyers, a supervisor in the Umatilla Soil Conservation District, Oregon, is growing **Sherman** in a wheat rotation. He plants 100 acres in strips, the rows at right angles to the wind, takes off two seed crops, and plows under the heavy root residue to improve his soil and protect it from wind and water erosion.

Here are some other nursery improved grasses and what they do:

Hard fescue—an understory grass for alfalfa-grass mixtures. It produces heavy roots without putting much grass in the hay. Also excellent for cover in orchards and on roadsides.

Sheep fescue—does the same thing in areas of less than 14 inches of rainfall and on range lands.

Figure 3. The intermediate shrub block and the observational woody plantings. From left to right the shrubs are: Grey dogwood, scotch broom, lilac, tamarisk, buffalo berry, jet bead, honeysuckle, American beach, Mexican plum. Some of the shrubs are now in the field planting trial stage.

New Specialty Grasses

Volga wildrye—a specialty grass propagated vegetatively and used to stop moving inland sand dunes. In addition to soil conservation districts, Army Engineers, Army Ordnance, and Bureau of Reclamation have used this plant in large quantities. Annual production is a million plants, all grown commercially.

Topar pubescent wheatgrass—presently the northwest's most drought resistant, sod-forming grass, is for use in alfalfa-grass mixtures and dryland waterways as well as in conservation seedings on better range lands.

Tall wheatgrass, Canada bluegrass, Siberian wheatgrass, sodar wheatgrass and many others are in advanced stages of improvement, final testing, naming, release and widespread use. Only a few of these new varieties were heard of five years ago, practically none of them ten years ago. They are becoming familiar to good conservation technicians, farmers and seed dealers.

Ten per cent is a conservative estimate for increased effectiveness and production from the use of improved varieties; many will run as high as 100 per cent better than previously available materials. Even with a slightly higher cost, certified seed of an improved variety is a good buy for conservation seedings. One year's income to seed growers of improved varieties would more than pay for all the development and testing costs from 1935 to the present.

Use of New Varieties Is Standard

Today, almost every seed store, Grange supply or farmers' cooperative uses standard grass and legume mixture recommendations. In Washington, Oregon and Idaho the county agent, SCS technician, the Forest Service or an ASC field man will give the same answer to the question, "What to plant?" *This did not happen by accident. It is based on solid data from mixtures in plots followed by field-scale planting trials on farms in soil conservation districts. It happened after many nursery training conferences and joint meetings at district, area, county and state levels. Progress was slow, but to simplify mixtures and make it possible for a farmer to get the same answer from any agency and then find the dealer with a plentiful supply of the improved recommended variety is just a little short of a miracle. It simplifies getting conservation on the land.*

Improved Trees and Shrubs

Progress has also been made by the Soil Conservation Service nurseries of the Northwest in the testing, introduction and standard recommendations for the use of woody plants for conservation.

Southernwood is one of the new shrubs finding ready acceptance in woody conservation plantings. Related to the sagebrush family, this introduced plant is propagated from cuttings in nursery plantings. Rooted cuttings are easy to handle. They transplant readily, grow quickly and have a high planting survival. Used on the windward row of a windbreak, plants attain a height of three feet the first year under irrigation. Stems are erect, straight and numerous. Plants have a shallow root system that competes with weeds. Plants are resistant to injury by insects and rodents and are winter hardy. This shrub is

an excellent addition to the quick-growing, hardy plants for use in windbreaks. In irrigated sections where one- or two-row windbreaks are desired, southernwood grows quickly and gives slow-growing rows of coniferous trees protection during their establishment stage.

Bitter cherry is a fast-growing, intermediate shrub for windbreaks. A specific strain from the west coast was found superior. It was propagated and put into field trials in comparison with Russian mulberry and Russian olive. Bitter cherry is showing better performance than either of these two standard species in many areas.

American plum brought in from the middle west is widely adapted; it has a wildlife as well as a conservation use.

Other woody plants now coming into conservation use are *bladder senna, Nanking cherry, hybrid poplar* and *snowberry*. Some superior woody plants are now commercially available. Others are becoming available through Clarke-McNary state tree nurseries. Cooperators in districts are benefiting directly from recommendations made as a result of many nursery trials.

Present Nursery Status

The Pullman Soil Conservation Service nursery is located in the heart of the rolling Palouse country, adjacent to the Columbia Basin, northern Idaho and vast areas of range land in eastern Oregon. Here, water and wind erosion, reduced soil organic matter, declining range yields, the need for drainage, correction of saline and alkaline conditions are a few of the many conservation problems.

The nursery has one primary function—to help solve these problems by getting better plants into use on farms in districts. It does this by:

1. Testing grasses, legumes, trees and shrubs to find or develop better plant materials for soil improvement and to determine the best cultural practices for their use in preventing soil and water losses.

2. Foundation seed production of improved strains of grasses and legumes and stock production of the better trees and shrubs for use in districts.

3. Getting plant materials from tests into conservation plantings on farms in soil conservation districts. This is done through field-scale planting trials which extend plot findings onto farms, and district seed increase which gets improved plants into quantity production.

The Pullman nursery observation plantings are on 100 acres of land made available by the Washington Agricultural Experiment Station. Sixty additional acres are used with the animal husbandry and agronomy divisions for cooperative pastures and soil improving rotation studies. The nursery also operates a 160-acre seed production farm where, in an intensive rotation, 30,000 to 60,000 pounds of high quality seed are produced annually. Most of this is breeder's or foundation seed. Under foundation seed agreements with experiment stations in three states and USDA agencies, the nursery is an official source and producer of new varieties. It maintains original material from which breeders seed is harvested.

Figure 4. An individual plant of Sheep fescue. A foreign plant introduction from Kenya, Turkey. This heavy root producing conservation grass is used in range plantings and in mixtures with alfalfa where it produced over 17,000 pounds of dry roots per acre in the surface eight inches of soil during a five-year period.

Promising plant materials from all temperate climates of the world first go to an observational nursery where they are tested in comparison with commercial varieties in similar conservation use groups. Over 14,000 grass, legume, tree and shrub accessions have been tested. After a five-year test period, superior plants are put into a permanent reference nursery so original material will always be available. This permanent nursery is actually a plant "blood bank".

Some superior plants are increased for use in mixture tests: First in cooperative tests on nursery sites; later on, the best mixtures, cultural trials or practices are extended onto farms through field-scale planting trials. At present there are 300 active trials in eastern Washington, eastern Oregon and northern Idaho SCD's. When test results are favorable, foundation seed is released through SCD's and Crop Improvement Associations, and seed becomes commercially available. The nursery reduces its

Figure 5. A field planting trial in the Bonner Soil Conservation District on the Ralph Lambert farm near Nordman, Idaho. Work Unit Conservationist Ed Nurmi is standing in a Meadow foxtail-Alsike seeding which is 2½ times as productive as the native meadow.

production to small foundation seed plots and concentrates its efforts on other pressing problems.

The Outlying Cooperative Nurseries

At present, 90 Soil Conservation Districts are served by the Pullman nursery and its six outlying cooperative nurseries. Each outlying cooperative nursery serves a specific problem area which includes surrounding soil conservation districts. Continuity of work and cooperative relations have been excellent.

Each of the following outlying nurseries is located on State experiment station land, and all work is cooperative:

Lind, Washington: The Dryland Experiment Station, rainfall 9.39 inches annually. This is a wheat-fallow, wind erosion area; and dryland range grasses as well as dryland trees and shrubs were tested.

Prosser, Washington: The Irrigation Experiment Station. Trees and shrubs for windbreaks and shelterbelts in the Columbia Basin are under test. Alkali and drainage problems are severe.

Moro, Oregon: The Sherman Branch Experiment Station. This is also a wheat-fallow area with soil but with rainfall conditions more favorable than at Lind, Washington. Extensive tree plantings as well as range grasses, grass mixtures and grass-legume mixtures are tested here.

Pendleton, Oregon: Important soil conservation research is also done here. Rainfall is 16 inches annually. This is a wheat-green pea area where sweetclover-grass mixtures in rotation as well as range grass mixtures are under test.

Union, Oregon: The Eastern Oregon Livestock Station. This lies in a mountain valley of sub-irrigated alkaline soil, surrounded by thousands of acres of range land. Grass and legumes, as well as trees and shrubs, are tested for alkaline and saline conditions, and a high water table. Pounds of beef produced per acre on improved irrigated pastures are being determined. This was preceded by extensive work on the palatability of grasses.

In the foothills, reseeding work has been done which points the way toward methods, species and management practices which will improve the conservation and production on adjacent rangelands.

Sandpoint, Idaho: The Northern Idaho Experiment Station, rainfall 30 inches, consists of cutover land and is typical of the soil conservation districts in northern Idaho and the northern counties in eastern Washington. Grasses and legumes for hay, pastures and rotations are being studied. Many seedings have been made on various timber burns in adjacent SCD's. Enough information has been found to make standard recommendations on how, where, what and when to seed.

This outlying system proves effective because results obtained on stations in these problem areas are directly applicable to problems in adjacent districts.

In getting superior plants into use, one of the final tests for grass-legume mixtures is the pounds of beef produced per acre. Seven 4-acre pastures established in cooperation with the animal husbandry and agronomy divisions have just completed testing the third set of mixtures with beef cattle. Intermediate wheatgrass fertilized with 100 pounds of nitrogen is proving just as productive as an alfalfa-grass mixture which produces 250 pounds of beef per acre. When grain is fed on pasture during the latter half of the season, the beef production jumps to over 500 pounds per acre. The pastures carry two animals per acre from May 15 through September 1.

Pasture trials which have been completed are grass alone vs. alfalfa-grass, sweetclover and grass vs. alfalfa and grass, pastures without grain vs. pastures with grain during part or all of the pasture season. These trials have attracted, during the years, thousands of people and additional thousands have become familiar with results

through publications on each phase of the work. The influence of these trials did not stop in the Palouse. It extended to the Kittitas SCD, which leased 40 acres of land near Ellensburg, Washington, and with nursery and other technical assistance repeated these pasture trials under irrigated conditions.

Cooperation with Other Groups

Leadership in grass and legume work has been achieved through the cooperation of many agencies truly interested in conservation. Projects have been active with the Agricultural Research Service in plant breeding; with the Washington, Idaho and Oregon Agricultural Experiment Stations in crop rotations and testing of mixtures; with the pathology division in plant diseases—particularly smut resistance in mountain bromegrass and seed treatment studies; with dairy husbandry on pastures; with the botany department on growth and development of grasses; with the entomology department on insect damage and control studies; and with agricultural chemistry on chemical analyses of mixtures.

There is cooperation with the school of forestry and range management, University of Idaho, on grass seed pelleting, germination studies of woody plants and the testing of new trees and shrubs; with the State Game Departments on utilization of woody plants as food by game birds; and with the Bureau of Reclamation in erosion control of sand dunes by vegetative means, using Volga wild ryegrass.

Many additional fundamental studies have been stimulated by other private and public agencies contributing to the improvement of plant materials. One such important study is with the Carnegie Institution of Washington. *Under the leadership of Dr. Jens Clausen, many native and introduced bluegrasses are being crossed to make new combinations resulting in grasses with superior conservation characteristics. In this study there are now 13,000 individual plants.*

Grass Roots Build Soil

Root production of grasses alone and in mixtures has helped sell conservation. An effective slogan is "Grass Builds Soil—Legumes Add Nitrogen." When mixtures are plowed out, nursery technicians look under the surface to see what has been accumulating. Excavating roots and separating the grass from the legume roots shows the value of mixtures much more than hay yields ever would. Grass-legume mixtures sometimes yield more than legumes alone. They usually make a better quality hay. But when it comes to the roots, the difference is striking. Alfalfa alone in five years produces from 8,000 to 10,000 pounds of dry root material per acre. Mixtures with intermediate wheatgrass will run up to 15,000 pounds, and

Figure 6. Sherman big bluegrass, a strain selected from the native vegetation in Sherman County, Oregon, and developed for use in dryland range seedings.

when such sod-producing grasses as hard and sheep fescue are used with alfalfa the root production jumps to 19,000 pounds per acre, almost twice as much as is produced by alfalfa alone.

This root material is what gives the soil built-in erosion resisting characteristics.

Monoliths of plants with their roots intact are dug and mounted. Several sets of these monoliths are kept in continuous circulation among districts and work units. Photographs of some monoliths have been supplied with visual aids. The root monoliths, pictures and root data have been very effective in pointing out the benefits of using grass.

Training Schools Are Effective

Annual training schools are used in getting information to technicians and district supervisors. Job training methods are used in presenting new techniques and information of use in the field. Special schools in seedbed preparation, grass seed harvesting, tree planting and other subjects are held as needed to keep the field men up to date. District supervisors at these conferences always keep the discussion at a practical level. Demands are often made and met for similar training to other groups of people.

Students from Greenland, Chile, Argentina, New Zealand, Bolivia, Korea, India, China and other countries

have spent extended periods at Pullman learning while working among the grasses, legumes, trees and shrubs. One such former student, Mario A. Rogers, made his second visit in connection with attendance at the grassland conference in 1952. He cut several things from his schedule in order to study carefully the entire nursery program in the Pacific northwest. World-wide inquiries for more information and new varieties attest that the Pullman nursery is known in many lands.

Services to Soil Conservation Districts

Among the things pioneered are: The processing of grass seed to remove awns to facilitate seeding of some difficult native plants, the use of depth regulators, alternate row seedings of grasses and legumes, the use of fertilizers as an aid to grass establishment, the use of fertilizers in grass seed production, the use of selective and 2,4-D sprays for weed control in grass seed production, grass seed treatment with fungicides, sweetclover-grass and alfalfa-grass mixtures.

Other services rendered to districts include the supplying of sheaf and seed display materials as visual aids. As one field worker put it, "It is much easier to sell grass and legumes when you can show the farmer what the new plant looks like." For Smith-Hughes teachers and county agents, seed packets are supplied for the establishment of row nurseries. Standard sets are made up for each problem area. They go out with instructions for planting, care and note taking. There are more than 100 such grass plantings in the northwest. Good use is being made of them by district cooperators. In some places, plantings have progressed to plots, pasture seedings or seed production trials. The generation growing up knows what important grasses look like and just how well they are adapted in the home locality.

Dr. B. R. Bertramson, chairman of the Agronomy Department at Washington State College, sums it up with this paragraph:

"The Soil Conservation Service nurseries have done a good job. The close cooperation between the Washington Agricultural Experiment Stations and the nurseries has paid off handsomely in results. Several publications on forage management have been jointly authored by Nursery and Experiment Station-Agronomy personnel. The new forage varieties developed for use in the Pacific northwest as a result of this teamwork are helping farmers get conservation on the land."

Other nurseries are doing a similar job in their respective localities.

LITERATURE CITED

1. Enteman, F. M., Schwendiman, J. L., and Patterson, J. K., 1952. Cultural Methods of Establishing Grass with Sweetclover and the Effect of Varying the Percentage of Grass and Sweetclover on the Crop Yield. Amer. Soc. Agron. Jour. 44: (10).
2. Galgan, M. W., Ensminger, M. E., Ham, W. E., Schneider, B. H., Schwendiman, J. L., Adlard, I. R., and Patterson, J. K., 1952. Grass and Grass-Alfalfa Pasture Supplemented with Grain for Hay Production in Eastern Washington. Wash. Agr. Expt. Sta. Cir. 164 Rev.
3. Hafenrichter, A. L., Mullen, L. A., and Brown, R. L., 1949. Grasses and Legumes for Soil Conservation in the Pacific Northwest. U. S. Dept. Agr. Misc. Publ. 678, 56 pp., illus.
4. Law, A. G., and Schwendiman, J. L., 1946. Bromar Mountain Bromegrass. Wash. Agr. Expt. Sta. Bul. 479, 8 pp., illus.
5. Law, A. G., Schwendiman, J. L., and Ensminger, M. E., 1949 Sweetclover Grass Pasture in Eastern Washington. Wash. Agr. Expt. Sta. Bul. 509, 11 pp., illus.
6. Miller, H. W., Ball, C. C., and Knott, N. P., 1948. The Comparative Value of Woody Plants as Food for Upland Game Birds. Wash. State Game Dept. Biol. Bul. 8, 40 pp., illus.
7. Miller, A. E., and Dwyer, C. H., 1952. Improved Management of Irrigated Pastures Pays Dividends. U. S. Dept. Agr Soil Cons. Ser. PA-205, 8 pp., illus.
8. Richards, D. E., and Hawk, V. B., 1945. Palatability for Sheep and Yield of Hay and Pasture Grasses at Union, Oregon. Oreg. Agr. Expt. Sta. Bul. 431, 51 pp., illus.
9. Morrison, K. J., 1953. Montgomery Red Clover and Drummond Timothy. Wash. State Coll. Ext. Cir. 231.
10. Schwendiman, J. L., and Law, A. G., 1946. Primar—A New Slender Wheatgrass for Conservation Use. Wash. Agr. Expt. Sta. Bul. 478, 16 pp., illus.
11. Schwendiman, J. L., Hafenrichter, A. L., and Law, A. G., 1953. The Production of Tops and Roots by Grass and Sweetclover When Grown in Mixtures. Amer. Soc. Agron. Jour. 45: 110-114.
12. Schwendiman, J. L., and Staff, 1953. Technical Conference of the Pullman Nursery Unit. U. S. Dept. Agr. Soil Cons. Ser. Mimeo in cooperation with the Wash., Idaho and Oreg. Agr. Exp. Sta.
13. Smith, O. W., Jacquot, H. D., and Brown, H. L., 1947. Stabilization of Sand Dunes in the Pacific Northwest. Wash. Agr. Expt. Sta. Bul. 492, 16 pp., illus.
14. Stark, R. H., and Klages, K. H., 1949. Manchar Smooth Brome. Idaho Agr. Expt. Sta. Bul. 275, 8 pp., illus.
15. Woods, J. E., Hafenrichter, A. L., Schwendiman, J. L., and Law, A. G., 1953. The Effect of Grasses on Yield of Forage and Production of Roots by Alfalfa-Grass Mixtures with Special Reference to Soil Conservation. Amer. Soc. Agron. Jour. 45:590-595.

The Nation's Water Resource Problems . . .

Water resource problems are not strictly localized, but have their effect on the entire population of the country.

The floods which close the stockyards not only hurt the farmers trying to sell their cattle but also create a temporary meat shortage and the ensuing price rises are passed on to all the consumers of meat products, irrespective of their location and profession.

Likewise the damaged bridges, roads, and utilities are the financial problems of everyone.

Flood damages to homes, furniture, and automobiles may be reflected in insurance rates, and increased assessments and tax rates outside the flooded areas.

Photo Soil Conservation Service

Sheet and rill erosion on a Michigan wheat field.

The erosion which robs the farmer of his topsoil also depletes the remaining soil of much needed minerals and trace elements which are vital to the health of the consumer of farm products. Silt from the eroded farmlands plugs culverts, roads and drainage ditches, using up taxpayers' money for removal. It may fill city reservoirs causing cities to increase water rates or taxes to pay off bonds for improved or new water supplies. The sediment also settles in navigation channels where Federal expenditures are necessary for its removal.

Erosion

In 240 B. C. the Chinese Tao Tse Ching wrote, "*Nothing under heaven is softer or more yielding than water but, when it attacks things hard and resistant, there is not one of them that can prevail.*" The Grand Canyon of the Colorado as well as wide expanses of agricultural land bear mute but impressive testimony to the wisdom in this quotation.

The damage to farm land is the result of accelerated or "man-induced" erosion. It has occurred because the protective covering of vegetation has been stripped from the soil. Then when uncontrolled runoff races down unprotected slopes, it carries with it the cream of our land —the topsoil. Sometimes the entire body of the soil is washed away, leaving only bedrock or some other sterile material, worthless for plant production.

Or perhaps water concentrates in drainageways in the more erodible soils and washes deep, destructively large gullies. In parts of one midwestern state land is being eroded by gullying at the rate of one-half acre per square mile each year.

Erosion has severely damaged about 280 million acres of crop and grazing land in the United States. Another 775 million acres of crop, grazing, and forest land have eroded to some extent. We now have left in the farms and ranches of the country about 460 million acres of land that is suitable for cultivated crops. This includes, besides land now in crops, about 95 million acres that need clearing, draining, irrigating, or other improvements

Left: Gullies like this are taking good land out of agricultural production. *Right:* Lack of water at the right time can result in soil blowing where the vegetative cover has been removed.

Photos Soil Conservation Service

Photos Soil Conservation Service

Top: Homes and industries in the town of Percival, Iowa, damaged when the Missouri River went out of its banks in 1952. *Center:* Flooding is a serious problem to homes. *Bottom:* Crop damage in the headwater areas is higher than most people realize.

to make them suitable for cultivation. All but about 100 million of this 460 million acres are subject to erosion if not protected.

Flooding

It has been estimated that floodwaters cause an aggregate average annual damage of approximately $545,000,000 in the *tributary headwaters* of our major rivers. This includes agricultural damages such as (1) crops, pasture, and land damage, (2) non-agricultural damage to transportation facilities, urban and industrial property, and (3) indirect damages resulting from the direct agricultural and non-agricultural damages, such as loss of income in processing agriculture products, loss of trade, delays in transportation and other such losses.

To this must be added another $500,000,000 annual flood damages *in the major river valleys*. These damages are agricultural and non-agricultural. This is significant because it again points up the fact that floods and their damaging effects concern all the people, whether they are rural or urban residents.

Thus the total average annual flood water and sediment damage in the United States exceeds a billion dollars. Of this total 56 per cent is upstream headwater damage and 44 per cent downstream major river damage. This indicates two major flood problems: The problem of reducing headwater damage, and the problem of providing protection to the heavy concentration of wealth and population in the great river valleys.

Sediment

Damages due to sedimentation are usually associated with damages caused by flooding. Material removed from the uplands by sheet erosion or gully erosion may cause sediment damage anywhere along the route from the point of origin to the ocean. Also, materials eroded from streambanks and from the flood plains by the scouring action of floodwater may cause damage farther downstream. It is estimated that the quality of soil moved from place each year in the United States by water erosion alone amounts to about four billion tons. About one-fourth of this reaches the oceans, the balance coming to rest at the foot of slopes, on floodplains, in reservoirs, harbors, etc. Some of the damages attributable to sediment may be described as follows: (1) *infertile overwash*, (2) *swamping*, (3) *filling of reservoirs and ponds*, (4) *increased costs of water filtration*, (5) *damage to transportation facilities, and* (6) *damage to drainage and irrigation facilities*. Tentative estimates of this type of damage for the United States as a whole approximate 175 million dollars annually.

Since sediment is a product of erosion, sediment damage is most likely to occur in areas having a relatively high proportion of land in cultivation. In the earlier stages of agricultural development, much of the material

Photos Soil Conservation Service

Left: The 1951 flood on the Kaw River left this sediment deposit. *Right:* The capacity of reservoirs and streams is being reduced by sediment.

deposited on the flood plains was very fertile and actually increased the productivity of the flood plain. With the acceleration of sheet and gully erosion, much of the material now being eroded is relatively infertile subsoil and may reduce the productivity on the flood plains when deposited there. In some cases the development of the deposition approaches that of an inverted soil profile. Under certain conditions it is practical to "turn under" deposits of sand or other infertile material by means of deep plowing. Even then there may be a tendency toward a droughty condition if a thick layer of coarse material is plowed under.

Swamping damage is usually caused by the development of natural levees along stream channels by deposition when the streams overflow their banks. The levees prevent the floodwater from returning to the channel thereby causing a wet or "swampy" condition even after the stream flow has returned to normal stage. It is estimated that the combined damage, infertile outwash and swamping is $50 million annually.

Deposition in all types of reservoirs reduces the water storage capacity and thereby causes damage regardless of the purpose of storage, whether it is for irrigation, municipal water supply, recreation, flood control or for some other purpose. Generally the problem is most serious in the case of the smaller reservoirs since the effects of sedimentation were not considered in the design. This type of damage is estimated to be $50 million annually.

Heavy concentrations of sediment add to the costs of filtration when a public water supply comes from a surface water source. Such costs, estimated as $5 million annually, include those for certain additional chemicals, cleaning filters and settling basins, pipelines, etc.

Both drainage and irrigation ditches are damaged by the deposition of excessive amounts of sediment. These damages, estimated as $17 million annually, are reflected in increased maintenance costs.

In addition to the above damages, millions of dollars are spent each year in cleaning and dredging harbors and navigation channels and removing sediment from urban areas including streets, factories, homes, etc. More sediment is dredged from our rivers and harbors each year than the volume excavated from the entire Panama Canal.

Other sediment damages would include damages to growing crops, to hydro-electric power installations, to wildlife, fish and recreational facilities.

Water Shortages

There are, and will continue to be, local areas where there is not enough water to fill people's needs. There are two ways to solve these shortages:

1. Augment present sources of water.
2. Control the use of water (*including restrictions*).

Neither of these solutions is easy, and either may be expensive.

In some areas it may be possible to increase the amount of ground water by locating and developing new well fields. Where ground water is the primary source, water must not be used faster than it is replenished. This has happened in many places where deep wells are becoming exhausted and pumping must be extended to deeper and deeper sources. If the use were geared to the speed with which the storage is recharged, the danger of exhaustion is avoided.

Surface storage is another means of augmenting water supplies. There are only a certain number of desirable reservoir sites. Probably the best sites have already been used. Erosion control on the watersheds is necessary if the reservoirs are to retain their capacity.

Drainage

Drainage is a primary water resource problem. It provides the means for soil aeration of wet land, prevention of and alleviating flooding of much agricultural

Photo Soil Conservation Service

Water-logged land resulting from too much water. Planting will be delayed and each sizeable rain will produce a similar condition.

land, and the removal of surface runoff once flooding has occurred.

Land drainage in the past has been one of the principal factors in developing our nation and increasing farm wealth. Even city and urban development have depended upon drainage. Central Park, New York City, for example, drained in 1858, was considered a menace to health. At that time this was the largest drainage works in the country.

The original total of all agricultural land in the United States which would materially benefit from drainage was approximately 216 million acres or 24 per cent of all potential agricultural land. Although 103 million acres of agricultural land has been drained by drainage enterprises, a great amount of drainage on the part of the individual landowner will be needed to provide the drainage necessary for good crop production. In the 1950 census 30 states reported drainage enterprises on over 46 million acres of agricultural land. Yet 12 million acres of this was not drained satisfactorily.

Wet agricultural lands are found on both flat and sloping topography. Wet lands may be low lying and so level that natural drainage is not available; they may contain potholes or marshes; they may be high lying sloping land with seepy areas or inherent wet soils.

Individual farms may be drained by surface drains, subsurface drains or by pumping. The method used depends upon elevation, topography and soil type. Outlets for individual farm drainage must be provided by natural channels or ditches constructed by drainage enterprises.

Irrigation

Irrigation has developed most extensively in the arid regions of the western part of the United States, where rainfall is generally not sufficient for the production of most crops. Here about 26 million acres of arid and semi-arid land have been developed for agriculture by the practice of irrigation. Without sufficient water, most of this area would be of little value for agriculture. However, under irrigation, it produces large yields.

In the humid area where the growing season precipitation ranges from 15 to 40 inches, drought periods of varying lengths of time which differ from year to year, are continually causing crop failures or crop yields are seriously reduced by lack of moisture. Quite often these drought periods occur when the plant requires its most moisture for optimum growth.

Lack of water supply is a basic problem in both the arid and humid regions. Yet, over widespread sections, less than half of the water applied to the land by irrigation actually benefits growing crops. This waste of water usually causes land damage by erosion, alkali accumulation, leaching or water-logging, and irrigation and farming costs are increased. Most of these problems can be helped or solved by practicing conservation irrigation.

Conservation irrigation simply means applying the needed amount of irrigation water without waste or damage to the land and maintaining soil productivity. It makes use of the irrigation and cropping methods that best fit the particular soil, slope, crop and water supply.

A field that has been properly drained with both surface and sub-surface drainage.

Photo Soil Conservation Service

International Conference on Arid Land Problems Draws Wide Interest . . .

SCIENTISTS FROM the United States joined with those from 25 foreign nations April 26-29 at Albuquerque, New Mexico, for an intensive review of arid land problems throughout the world.

This international meeting was sponsored by the American Association for the Advancement of Science and supported by the National Science Foundation, the Rockefeller Foundation and UNESCO.

Despite steady growth of technology in the many fields that contribute to better living in and on the dry lands of the world, many of the scientists attending the symposium seemed to agree that the final solution is for man to learn to recognize and live within the resource limitation of these water-scarce regions that cover about 35 per cent of the habitable area of the earth.

Major contributions to the three-day conference on the campus of the University of New Mexico were made by members of the Soil Conservation Society of America. They presented papers on various aspects of research, on soil and water conservation, hydrology, snow survey and water flow forecasting and related subjects. Other SCSA members were prominently identified on planning and arrangements committees for the symposium and the subsequent field tour.

Dr. Charles E. Kellogg, Assistant Administrator for Soil Survey, Soil Conservation Service, was one of three principal speakers who presented longer papers at public evening sessions of the symposium. Dr. Kellogg, dealing with *"The Role of Science in Man's Struggle on Arid Lands,"* said, "The present unrest in the world about food and opportunity is not due to material shortages in the past . . . The unrest is due to a new realization of the enormous shortages we have in terms of what is possible with the full use of modern science."

Cyril Luker, SCS field representative for the West, from Washington, D. C., and another SCSA member told the assembly of more than 500 scientists that unless farmland is used only "within its capabilities, its yield is sure to fail and it may even be permanently damaged." He asserted that in arid climates "the balance between land, water and people is more critical than in any other agricultural province. When the balance is upset, the consequences are generally more severe than in humid areas because recovery from the effects of overuse usually takes longer in arid zones."

Another SCSA member, John H. Dorroh, Jr., SCS hydrologist at Albuquerque, New Mexico, reported studies

Figure 1. Three SCSA participants in the International Arid Lands Symposium at Albuquerque, New Mexico, take a break between sessions. Left to right, George R. Phillips, Dr. Charles E. Kellogg and Cyril Luker, all of Washington, D. C.

in Southwestern states which revealed that 98 per cent of the water that falls on these arid lands is either consumed where it falls by plants or evaporation or is lost in transportation to points of downstream use.

Several scientists from the U. S. and foreign countries reported research into cloud seeding as a means of inducing and increasing precipitation. They generally agreed that precipitation can be induced under proper conditions, by cloud seeding, but are not agreed as to the extent this process may be controlled or utilized to affect rainfall patterns.

Dr. E. G. Bowen, Chief, Division of Radiophysics, Commonwealth Scientific and Industrial Research Organization, Sydney, Australia, presented one of the most provocative papers in this field. His studies indicate, he said, that one of the most important factors controlling rain formation may be fall-out of meteoric particles into clouds. This accounts, he believes, for distinctly similar yearly patterns of precipitation peaks throughout the world. And, if his theory works out, *"it might have the most profound effect on our concepts of artificial control of the weather. It implies that the fundamental rainmaking process in the atmosphere is a seeding process,"* he said.

A paper by Dr. C. Warren Thornthwaite reported on determinations of water requirements of plants as a means of obtaining "maximum returns possible with water available." An Egyptian scientist—Colonel Omar Draz of the

Desert Institute at Heliopolis, Egypt—told of selecting animals best adapted for the use of limited available food and water. A French engineer, Jean Tixeront of Tunisia, told of using archeological remains to locate new water wells.

Dr. Homer L. Shantz, pioneer desert researcher and educator, who along with Dr. Kellogg and Dr. B. T. Dickson, Australian botanist, was one of the principal speakers, said the dry wastelands of the world are spreading and that the villain is man; the cause is over-use. R. O. Whyte, New Zealand agronomists now with FAO in Rome, described international teamwork being employed to restore vegetation to man-made deserts in the Old World.

Questions of competitive uses of water were explored by several participants in the symposium. Louis Koenig, vice president of the Southwest Research Institute, San Antonio, Texas, for example, submitted the proposition that the use of irrigation in the arid lands of the 20th century is not an appropriate use of this valuable resource. He argued that from the standpoint of water use, agriculture is a marginal use of water. *"In the United States an acre foot of water will support about 60 times as many workers when used in manufacturing than when used in agriculture on arid lands . . . Let the humid regions ship food into the arid . . . the arid lands should then look toward industrial rather than agricultural expansion."*

Insect problems were viewed by a Russian-educated, English scientist, Dr. B. P. Uvarov, as threats to newly-reclaimed farm lands in desert. And as a further sample of the diversity of topics, an American geochronologist, T. L. Smiley, of the University of Arizona, provided a weather summary tracing drouths during the last 10,000 years, by tracing the results of studies of growth rings in trees.

On the final day of the meetings, participants broke up into small discussion groups as a means of obtaining freer exchange of views and ideas on topics covered more formally by speakers on the program. Administrative, social, legal, economic and physical aspects of land use, soil and water conservation, and plant and animal management were discussed.

Following the sessions in Albuquerque, many of the scientists joined in a two-day field trip through southern New Mexico, followed by a session at Socorro, New Mexico, to integrate ideas developed during the symposium and to draw up a pattern for world-wide action. Finally, on May 5, the UNESCO Advisory Committee on Arid Zone Research held a closed meeting, also at Socorro.

Previous symposia sponsored by UNESCO have dealt with separate aspects of the problem of aridity, but this was the first general meeting on the subject. It was also the first to attract such large attendance and widespread interest, conference officials reported.

—D. HARPER SIMMS

Our Wasted Investment

(*Continued from page* 179)

the nation was sufficiently occupied with world affairs so that most problem areas were provided with stimuli which temporarily alleviated their financial plight. Consequently, interest in rural zoning, other than for restrictions connected with highway, suburban and airport construction, has waned and it appears as though much costly and time-consuming re-education will be necessary before the general public will again recognize the need for sound zoning laws to govern uses of agricultural, grazing and forest problem-lands; or else, the general public must be willing to pay farmers price supports for many years to come—price supports which, in the long run, only prolong the misuse of much of our marginal and submarginal agricultural lands.

LITERATURE CITED

1. Albers, T. M., "Progress in County Zoning, Marathon County, Wisconsin," *Journal of Land and Public Utility Economics* 16, 393-394 (1940).
2. Allen, Kenneth G., *Southern Illinois*, University of Illinois Press, 27 (1949).
3. Brown, Nelson C., "Community Forests: Their Place in the American Forestry Program," *Journal of Forestry*, February, 1941.
4. Foster, Ellery, "A Plan to Help Stabilize Rural Economy by Wise Use of Forest Resources," *Journal of Forestry*, August, 1941.
5. Graham, Edward H., *Natural Principles of Land Use*, Oxford University Press, New York, 123 (1944).
6. Hopkins, John A., "Changing Structure of Agriculture and Its Impact on Labor," *Journal of Farm Economics*, 113 (1941).
7. Hugh, R. Pomeroy, "County Zoning Under the California Planning Act," *The Annals of the Association of American Geographers*, 58, May, 1931.
8. International Yearbook, 13 (1937).
9. National Resources Planning Board, Technical Paper Number 6, "Area Analysis—A Method of Public Works Planning," Washington, D. C., 1943.
10. Rural Resettlement Administration, "First Annual Report," *Land Policy Circular*, Washington, D. C., 1936.
11. U. S. Department of Agriculture, "County Land Use Planning, Series No. 1," Washington, D. C., 5 (1938).
12. U. S. Department of Agriculture, "Report of the Administrator of the Resettlement Administration," 4, (1937).
13. U. S. Department of Agriculture Yearbook, Soils and Men, Washington D. C., 384 (1938).
14. U. S. Department of Agriculture, "United States Farm Credit Associations—Helping the Farmer to Pay His Debts," *Miscellaneous Publication 316*, Washington, D. C., 3 (1935).
15. Walker, Herman, Jr., "Recent Progress in the Enactment of Rural Zoning Enabling Legislation," *Journal of Land and Public Economics* XIV, 334 (1938).
16. Wilson, M. L., "Problem of Poverty in Agriculture," *Journal of Farm Economics*, 10 (1940).
17. "Zoning Problems and Their Relative Importance," Indiana State Planning Board 17, January, 1937.

ELEMENTS OF SOIL CONSERVATION *(Second Edition).* By Hugh Hammond Bennett. *McGraw-Hill Book Company, Inc., 333 West 42nd Street, New York 36, N. Y. 1955. 358 pages. $3.96.*

Any book is important that bears the name of Hugh Bennett, the daddy of the soil and water conservation movement.

This second edition of his *"Elements of Soil Conservation"* comes in an even more usable form than the first edition. It has been given a good going-over by the author, has been completely reset by the printer, and is now offered in a more modern and handsome typography. Although it follows the original organizational scheme, much additional material has been added to bring the book up to date, including a complete new chapter on *"Upstream Flood Control."*

Here is an elementary textbook based on sound research and on the actual field experience of the Soil Conservation Service. Every conservation measure and practice set forth has had a thorough trial on American farms. Young people will find the new edition an interesting and fruitful adventure in the pursuit of knowledge —an honest, unemotional and straightforward guide to a fundamental subject.

There are ample halftones, maps and drawings. There are questions at each chapter's end. But contrary to many current texts, there are no fancy gadgets to confuse the understanding.

This edition should prove even more popular than its predecessor. It is a definite contribution to the cause of preparing the new generation for the responsibility of caring for the nation's basic resource, the soil. It is needed equally by city youth and their country counterparts. Teachers themselves will benefit from its conciseness, clarity and comprehensiveness. And should cruising parents come upon the book it will surely do no harm.

—Wellington Brink, *Washington, D. C.*

THE LIFE AND TIMES OF A HAPPY LIBERAL: *A Biography of Morris L. Cooke.* By Kenneth E. Trombley. *Harper & Brothers, New York. 1955. 270 pages. $4.00.*

That the "Happy Liberal" of the above title should turn out to be an engineer may come as somewhat of a surprise to those who are familiar with the name "Morris L. Cooke," but not acquainted with all the varied aspects of his extremely full life. Morris L. Cooke's career as a distinguished public servant must certainly set a record for length of service as well as for outstanding success in performing a variety of important missions.

From the turn of the century down to the present time, Cooke has more often than not been in the forefront of public affairs—starting as Philadelphia's director of Public Works and including such positions as the first director of the Rural Electrification Administration, a Roosevelt assistant who helped establish the Shelterbelt Project, surveyed the water problems of the Mississippi Valley, adjudicated the dispute between Mexico and the United States over expropriation of oil properties, chairman of the 1951 Water Resources Policy Commission, and recently served as a troubleshooter in getting Point IV under way.

Cooke has taken an active part in shaping the nation's conservation policies and has unvaryingly been a steadfast defender of the public interest. The real tribute to Cooke will stand in the form of the many accomplishments of his long public service, but it is good to have this formal documentation of his greatness in Kenneth Trombley's excellent biography.

—L. G. Hines, *Hanover, New Hampshire.*

LAND JUDGING. By Edd Roberts. *University of Oklahoma Press, Norman, Oklahoma. 1955. 120 pp. $2.50.*

In a simple forthright manner, "Big" Edd discusses the importance of soil, how to judge land by physical characteristics, the land judging score card, conducting land judging contests and the aids and stimuli that make land judging successful. This simplicity of presentation characterizes the language and visuals which he uses in his own field presentations.

It has been my privilege to observe first-hand the development of land judging as an educational method for increasing knowledge about the use and treatment of soil. Land appreciation schools and land judging are widely used throughout the United States. Although accurate statistics are not available, we believe that more than 100,000 people did land judging in 1954 and the method is in use in at least 30 states. The author is a recognized leader in this land judging development, a leadership which grew from the conviction that a technique comparable to livestock judging would be effective, and from an intensive personal experience in supervising land judging events in Oklahoma.

There is consensus that the principal values of land judging are gained in the local activities where the land

use and treatment determinations can be used on the home farms and ranches. The motivation from contests probably has best results in such situations. However, the great interest in state, regional and national judging contests indicates that these events add glamour. 4-H Club members and vocational agricultural students generally show a great interest in this activity.

"Land Judging" will have its greatest usefulness, I believe, as a reference in carrying out the local land judging events.

—W. R. TASCHER, *Washington, D. C.*

Conservation Films

Our Productive Land. *16 mm., sound and color. 10 minutes running time. Produced by Pat Dowling Pictures, 1056 South Robertson Blvd., Los Angeles, California.*

This film presents the broad aspects of American Agriculture with conservation as the main theme. In telling the story of *"Our Productive Land,"* a variety of crops are shown. Scenes of early-day farming are presented in contrast to modern methods.

Our Natural Resources. *16 mm., sound and color. 10 minutes running time. Produced by Pat Dowling Pictures, 1056 South Robertson Blvd., Los Angeles, California.*

The chief natural resources of America—timber, minerals and water—are first presented in this film. Then specific ways of conserving these resources for future use are explained.

Author of True-to-Life Books Dies, Leaves a Rich Heritage

Dr. R. W. Eschmeyer's death in May of this year stopped forever a fresh flow of basic conservation concepts written in an easy-to-understand style. He converted the most complicated into simple terms; he did big things with little words.

His *True-to-Life* stories about fish and game animals are a classic example of his artistry, for they appeal to all ages and to all educational levels, the most amazing breadth of coverage ever accomplished by conservation literature. Using a fish or a game animal as a central character, ***his stories show the relationship and involvements of land and water with living things. They teach, too, that man's part in life's structure is perhaps most important, for man can shape the nature of his environment—he can either enhance it, or wreck it.***

It's small wonder that these books are award winners, that education and conservation authorities continue to applaud the *True-to-Life* stories, that sportsmen buy them in give-away quanties for distribution to schools—that everywhere the *True-to-Life* stories are considered vital to a progressive and understanding attitude toward all of our natural resources.

A completely new approach to Children's literature

The TRUE-TO-LIFE stories are important steps toward a better hunting and fishing future . . . an understanding of wildlife and its management . . . an appreciation of all our natural resources. Each book is a highly entertaining story, profusely illustrated to give it exciting clarity for young, imaginative minds. Each book, too, is completely accurate, written by a leading conservationist, checked by top-ranking specialists.

"Unlike the gushy sensationalisms and unrealistic plots of many present-day animal stories for young readers, the TRUE-TO-LIFE series is written in an entertaining, yet factual manner, devoid of human distortion, and depicting the dynamic world in which game animals live.

Cleverly woven into each story are lessons in sportsmanship and in management of our nation's renewable natural resources—its soil, water, forest, and animals."

Outdoor News Bulletin
Wildlife Management Institute

TRUE-TO-LIFE Stories received 1953 publication award from National Association of Conservation Education and Publicity. Recommended by Soil Conservation Society of America, the Boy Scouts of America, National Wildlife Federation, Izaak Walton League of America, Outdoor Writers Assn. of America, American Nature Assn., Wildlife Society, and other national and local education and conservation organizations.

FREE with each set of 10 clothbound TRUE-TO-LIFE STORIES, a 100 Question Wildlife Quiz and My First Wildlife Library Bookcase.

Soil Conservation Society of America, H. Wayne Pritchard, Sec., 1016 Paramount Building, Des Moines 9, Iowa

Gentlemen: Please send the following books as soon as possible. I enclose ☐ check ☐ cash ☐ money order in full payment.

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Field Notes

Successful Farming and Nebraska Farmer Given Nationwide Soil Builders Awards

Kirk Fox, editor of SUCCESSFUL FARMING, Des Moines, Iowa, and Tom Leadley, editor of THE NEBRASKA FARMER, Lincoln, were recently presented awards for *"superior journalistic contributions toward the building of the soils of our nation"* by the National Plant Food Institute.

Mr. Fox received the award for the second time since the nationwide "Soil Builders Award for Editors" contest was established in 1952, with the approval of the American Agricultural Editors' Association. The presentation was a feature of the preliminary convention program for the Institute, which will represent the consolidated memberships of the American Plant Food Council and The National Fertilizer Association as of July 1.

Scrolls signed by the national judges were awarded Mr. Fox, representing the winner among magazines of more than 300,000 circulation and to Mr. Leadley, representing magazines of less than 300,000 circulation. The 44 national farm magazines entered represented a total readership exceeding 50,000,000.

Features judged included stories, editorials, illustrations, and combinations of the three categories. The winning staff writer or staff member designated by the editor of the winning magazines will receive a plaque at a meeting of the American Agricultural Editors' Association this winter.

Second Watershed Congress Planned for December 5-6, Washington, D. C.

Selection of key committee men to lead the four sessions of a second National Watershed Congress has been made by a group of co-sponsoring organizations. At a May 11 meeting in Chicago, representatives of most of the 20 or so sponsors also decided on the format for the two-day conference to be held December 5 and 6 in Washington.

Under the direction of a general committee the second Congress will take up four main topics, each to be prepared by separate committees of eight to ten members. The four committees and their chairmen are: 1 Obtaining maximum value for all objectives in watershed programs: Marshall W. Qualls, Kentucky Division of Soil and Water Resources, Frankfort; 2 Federal responsibility and needs: Gordon Zimmerman, National Grange, Washington, D. C.; 3 State responsibility and needs: Robert Crosby, Lincoln, Nebraska; 4 Local responsibility and needs: Oliver Hyatt, Little Hoosac Watershed Association, Cherryplain, New York.

"She's been stepping high since the boss renovated that pasture."

The Watershed Congress hopes to bring together about 1,000 persons interested in developing soil and water conservation programs in small upstream areas. They will be told how all the partners can work together for a well-balanced community watershed project. Reports will be made on status of projects under way.

Journal Reprint Featuring Soil Erosion Survey of Latin America Widely Acclaimed

In the July 1954 number of this JOURNAL there appeared the first installment of the *Soil Erosion Survey of Latin America,* a joint undertaking of The Conservation Foundation and the Food and Agricultural Organization of the United Nations. The second and third installments were printed in subsequent issues of the JOURNAL. In November 1954 the report was reissued together with its three color maps in the form of a consolidated reprint.

With the cooperation of the Washington offices of the Pan American Union and the Pan American Institute of Geography and History in Mexico City over 4,000 copies

of the Survey have been mailed to governments and individuals throughout Latin America. Several hundred copies were sent out on request to American colleges, to the U. S. Soil Conservation Service and to a number of American corporations with Latin American interests.

The response to this distribution has been gratifying. Comments have poured in by the hundreds. A section of the Survey was translated and reprinted in a Mexican cattle ranchers' magazine. One of Brazil's foremost dailies ran a two-installment editorial highlighting the Survey and recommending that steps be taken to check erosion in that country. Panama's Department of Agriculture took the Survey as a point of departure and revised both map and text in the field. The revised version of the map has just been received by The Conservation Foundation.

Don José Figueres, the president of Costa Rica, has commented favorably on the Survey and has circulated it among his professional government staff. The National Museum of Brazil has offered to translate the entire report in Portuguese and the Foundation hopes to makes a similar arrangement for a Spanish translation with the Pan American Institute of Geography and History in Mexico City.

The comments that have reached us range from acknowledgments and names of other persons interested in receiving a copy to useful additions and corrections for a future revised edition. The Foundation library is accumulating valuable source material dealing with the erosion problem in Latin America, which the recipients of the Survey have sent on their own initiative. For example, the government of Costa Rica has sent a copy of its recently enacted soil conservation law to show that our call for action is being heeded, at least in that republic.

The supply of reprints has been exhausted but in a forthcoming issue of this JOURNAL we hope to report the publication of both Spanish and Portugese translations.

Watersheds Are Damaged by Forest Fires

The U. S. Department of Agriculture recently announced that forest fire damage on national forests was estimated at $3.7 million for calendar year 1954.

According to reports from Forest Service field offices 7,369 forest fires—3,425 of them man-caused—burned 107,656 acres of national forest land during 1954. The timber damage was $1,062,489.

The destruction of ground cover, such as grass, trees, and shrubs, resulted in damages of $2,227,455 to watersheds which supply a large part of the water used in the west for industry, irrigation farming, and in the home. These damages appear in erosion of topsoil, excessive silt in streams and reservoirs, flash floods, and in a few instances mudflows. Damage to other non-timber resources such as wildlife, recreation, and forage was $447,033.

The 1954 report shows an across-the-board improvement over the 1953 national forest fire record. During that year 8,353 fires burned 231,314 acres of national forest land, leaving in their wake an estimated damage of $14,489,594.

Phosphate Counteracts Temperature Effects

An average of 12 tons of alfalfa hay per acre was produced over a 4-year period in an experimental program at Yuma, Arizona, with adequate phosphate and frequent irrigations. This is more than double alfalfa hay yields in this area. With frequent irrigations and sufficient supplemental phosphate, water utilization efficiency was also greatest. A ton of alfalfa hay could be produced with about 8 acre-inches of irrigation water under these conditions, whereas, 14 acre-inches were required where the phosphate and moisture supply were not optimum. In the latter case an initial application of 100 pounds of P_2O_5 was applied and the alfalfa was irrigated only when it approached wilting.

Alfalfa is one of the most important crops in sandy soils of the hot desert area of southwestern Arizona. During July and August temperatures at the 6-inch depth frequently reached 100° F. and sometimes are as high as 110 F. These excessive temperatures appear to inactivate the alfalfa root system near the surface requiring it to obtain its moisture and nutrients at greater depth where temperatures are acceptable. On the other hand, if sufficient phosphorus is applied to penetrate greater than one foot the plant appears to alter its rooting habits less radically, feeding closer to the surface to obtain phosphorus (and moisture) than where phosphate is not applied. Thus the plant withstands debilitating temperatures to obtain phosphorus without which growth would be limited. Large applications of phosphate are necessary in Superstition fine sand to obtain sufficient penetration to be available to the active root system of alfalfa during the summer months. An initial application of more than 200 pounds of P_2O_5 and frequent irrigations, for their cooling effect, are indicated as goals for farmers to approach.

—C. O. STANBERRY

The Result of Education

Perhaps the most valuable result of all education is the ability to make yourself do the thing you have to do, when it ought to be done, whether you like it or not; it is the first lesson that ought to be learned; and however early a man's training begins, it is probably the last lesson that he learns thoroughly.

—THOMAS HENRY HUXLEY

News Notes

First 100,000 Copies of Society's "The Story of Land" Sold; Booklet Widely Acclaimed

In the May JOURNAL OF SOIL AND WATER CONSERVATION, the *Society's* new booklet was announced for the first time. Following the announcement, several promotion letters were sent to various groups including members of the *Society*, soil conservation districts, utility companies and others. The response actually "swamped" the national office. Letters of inquiry arrive daily, the first 100,000 copies will be sold before the end of June and prospective distribution of additional thousands is assured.

Typical of the comments received are the following:

"'The Story of Land,' a unique and effective booklet that adopts a comic-book format to tell the story of the use and misuse of land throughout the history of man, was released recently by the *Soil Conservation Society of America*. Containing numerous descriptive sketches and terse captions, the booklet highlights man's dependency on soil down through the years, according to the Wildlife Management Institute."

"I like the new booklet. It made a good impression with several who saw it here in the office. In fact, much better than others set up to perform a similar purpose. I'd say this test from a critical publicity and advertising department is most favorable."—Walter Gumbel, editor, JOURNAL OF SOIL AND WATER CONSERVATION, and soil conservationist, Monongahela Power Company, Fairmont, West Virginia.

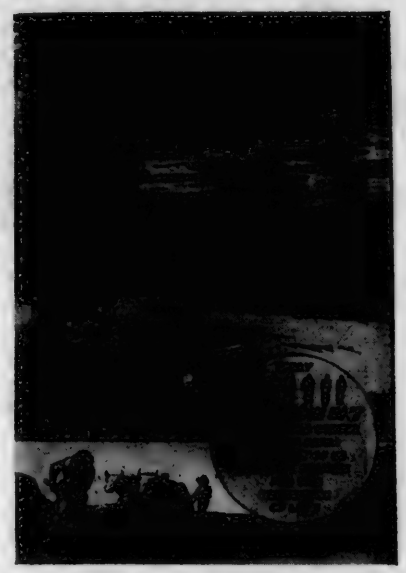
"I would like to order 1,000 copies of 'The Story of Land.' This booklet will be given away to those persons viewing the television "Report from Rutgers" which this week is featuring a lecture by Dr. Firman E. Bear, professor emeritus of agricultural chemistry at our College of Agriculture. The lecture is entitled 'Land, Food and People.'"—Nat Shoehalter, director of Radio and Television, Rutgers University.

"It occurs to me that your bulletin in color is well done and should have a large circulation in both public and parochial schools. It is the type of thing that our young people should learn as they are in their formative years. It is presented in a manner that will be most attractive to them. I feel that your organization has done a good job on it and should be quite proud of it."—Frank M. Atchley, agricultural consultant, Grocery Manufacturers of America, Inc.

Nolen J. Fuqua Comments

"A few days ago I saw the new publication being distributed by the *Soil Conservation Society of America*. This is an outstanding booklet that deserves wide distribution."—Nolen J. Fuqua, president, National Association of Soil Conservation Districts.

"I should say the *Society* has scored again! 'The Story of Land' is a knockout. Whoever dreamed up this one surely ought to get a medal and a life membership in the *Society*. Who was the author?



I'd like to drop him a note of congratulations."—William L. Southworth, program advisor, National Association of Soil Conservation Districts.

"We want to send information about 'The Story of Land' to members of the National Catholic Rural Life Conference. Please send us order blanks and publicity material."—Rev. Michael P. Dineen, executive secretary.

20,000 Copies on Order

A letter from Lyness G. Lloyd, state conservationist, Soil Conservation Service, Bismarck, North Dakota, reports: "At the May 23 meeting of the board of directors of the North Dakota Association of Soil Conservation Districts, a project for statewide distribution of the booklet 'The Story of Land' was approved in cooperation with M. F. Peterson, superintendent, State Department of Public Instruction. The board of directors of North Dakota ASCD will buy 10,000 copies. An additional 10,000 copies will be purchased by local districts. The booklet will be distributed to teachers at county teacher institutes and to all sixth and seventh grade pupils in North Dakota."

"Because your materials are so good, we hope that you will develop at some later date some type of free informative publication so we can include your organization in our listing. As a teacher, I believe other teachers would be happy to obtain copies of your inexpensive aids if they knew about them, and we would like to include your address so teachers may contact you."—Gordon S. Salisbury, Catalog of Free Teaching Aids, Riverside, California.

Some criticism of the booklet "Story of Land" has been made. D. O. Rettinger,

(*Continued on page* 210)

Nominations Committee Reports

The constitution and by-laws of the *Society* state that an annual election shall be conducted by mail ballot each year. Nominations for national office and council may be made by chapters, by the signature of ten members, or the nominations committee may consider nominations submitted by individuals. All nominations duly received must be placed on the ballot if the individual nominated gives his consent. The nominations committee is essentially a clearing house for all details relating to the task of filling the offices. Changes last year make it no longer necessary for two candidates for each office.

Adrian C. Fox of Bismarck, North Dakota, chairman, has reported for the nominating committee and announced the following slate of candidates for 1956:

For President:

E. H. Graham, Soil Conservation Service, Washington, D. C.

For First Vice President:

O. M. McConkey, Professor of Field Husbandry, Ontario Agricultural College, Guelp, Ontario, Canada.

J. S. Russell, Farm Editor, Register and Tribune, Des Moines, Iowa.

For Second Vice President:

Russell G. Hill, Executive Secretary, State Soil Conservation Committee, Michigan State College, East Lansing, Michigan.

For Treasurer:

Howard F. Barrows, Soil Conservationist, Austin-Western Company, Aurora, Illinois.

For Council Member at Large (one to be elected):

Harry M. Chambers, Deputy State Conservationist, Soil Conservation Service, Oklahoma City, Oklahoma.

I. O. Hembre, Executive Secretary, State Soil Conservation Committee, University of Wisconsin, Madison, Wisconsin.

Harold M. Rhodes, Soil Conservation Service, Morgantown, West Virginia.

J. K. Vessey, Assistant Regional Forester, U. S. Forest Service, Missoula, Montana.

For Council Member—Western Region:

Herbert A. Hopper, Field Representative, California State Soil Conservation Commission, Sacramento, California.

Ballots will be mailed to all members on or about July 14, 1955, and must be returned to the national office by September 1, 1955.

In the May issue of the JOURNAL OF SOIL AND WATER CONSERVATION was a proposal for a change in the constitution and by-laws relating to the objectives of the *Society*. A ballot will be enclosed for the proposed change which has been recommended by a special committee that spent two years studying the proposal. The proposed change has the approval of the national council and was supported by a resolution approved by the general membership at the 10th annual meeting. A two-thirds majority is necessary to change the constitution.

Soil Conservation Society of America
10th Annual Meeting
Green Lake, Wisconsin
September 12-13-14, 1955
See pages 185-188 and 208-209 for information concerning the schedule of events and hotel reservations.

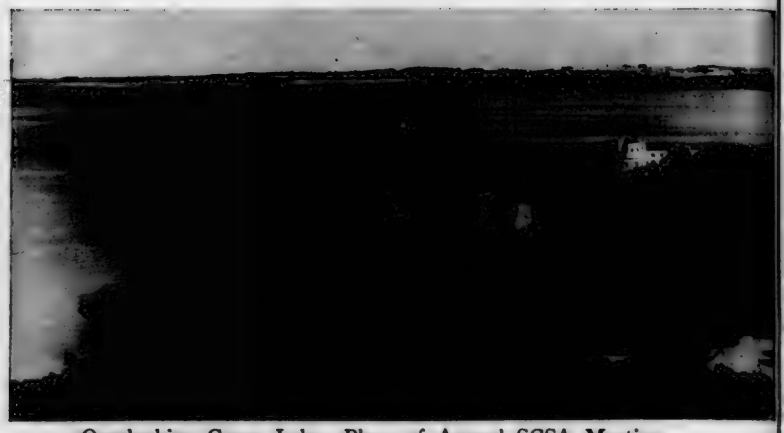
10th Annual Meeting

S · C · S · A

Soil Conservation Society of America

Green Lake, Wisconsin

September 12 - 14, 1955



Overlooking Green Lake—Place of Annual SCSA Meeting. American Baptist Assembly, Green Lake, Wisconsin.

Preliminary Program

SUNDAY, SEPTEMBER 11

1:00 P.M.—REGISTRATION

MONDAY, SEPTEMBER 12

10:00 A.M.—OPENING SESSION

Presiding, RUSSELL G. HILL, Michigan State College, East Lansing, Michigan

Invocation

Greetings—THE HONORABLE WALTER J. KOHLER, Governor, State of Wisconsin

Welcome—I. O. HEMBRE, President, Wisconsin Chapter, SCSA

President's Message—AUSTIN L. PATRICK, Washington, D. C.

Keynote Address—(To be filled)

1:15 P.M.—AFTERNOON SESSION

Presiding—(To be filled)

Behavior of Water on Land—LLOYD HARROLD, Project Supervisor, Agricultural Research Service, Coshocton, Ohio

State Legislation and Its Relationship to the Watershed Program—CARL B. BROWN, Soil Conservation Service, Washington, D. C.

Putting Land to a Safe and Sustaining Use Through Zoning—W. A. ROWLANDS, Extension Service, University of Wisconsin, Madison

8:00 P.M.—EVENING SESSION

Presiding, EDWARD H. GRAHAM, Vice President, SCSA, Falls Church, Virginia

Annual Business Meeting of the Soil Conservation Society of America

9:30 P.M.—*Social Hour*—Wisconsin Chapter, SCSA

TUESDAY, SEPTEMBER 13

8:15 A.M.—MORNING SESSION

Presiding, O. J. ATTOE, Soils Department, University of Wisconsin

Continuous Cultivation—Its Conservation Significances—JOHN B. PETERSON, Head, Department of Agronomy, Purdue University

Soil Fertility — Plant Growth — Animal Nutrition (The Kellogg Nutrition Study) — LLOYD TURK, Director, Agriculture Experiment Station, Michigan State University

Panel: Problems in Managing Non-Agricultural Areas in the Lake States—SHIRLEY ALLEN, Conservation Commission, State of Michigan, leader; CLARENCE PROUT, Deputy Commissioner of Conservation, State of Minnesota; DEAN COCHRAN, Regional Forester, U. S. Forest Service, Milwaukee, Wisconsin; HASKELL NOYES, Sportsman, Milwaukee, Wisconsin; N. S. STONE, Vice President, Mosinee Paper Mills Company, Mosinee, Wisconsin.

1:15 P.M.—AFTERNOON SESSION

Presiding, WILLIAM RUSSELL, Assistant State Conservationist, Soil Conservation Service, St. Paul, Minnesota

Industry's Stake in Land and Water Conservation —WILLIS H. SCHOLL, Vice President, Allis-Chalmers Corp.

1:45 P.M.—*Soil Conservation Society Chapters in Action*—WALTER C. GUMBEL, moderator; assisted by JOHN GRANT, JACK L. BARRICK and HAROLD M. RHODES.

5:30 P.M.—*Chicken Barbecue.* Courtesy, Wisconsin Industry

8:00 P.M.—EVENING PROGRAM

Presiding, ELMER L. SAUER, Agriculture Research Service, Urbana, Illinois

Presentation of SCSA Awards—R. H. MUSSER, Chairman Fellows and Honorary Membership Committee, Arlington, Virginia

Address—DR. M. M. HARGRAVES, Mayo Clinic, Rochester, Minnesota

WEDNESDAY, SEPTEMBER 14

8:15 A.M.—MORNING SESSION

Presiding, FLOYD HEFT, Ohio Soil Conservation Committee, Columbus, Ohio

Panel: How We Do Extension Work in Soil Conservation—WENDELL TASCHER, Extension Soil Conservationist, Washington, D. C., leader; E. O. BAKER, Erosion Control Agent, Eau Claire, Wisconsin; ARNOLD WIEBUSCH, Soil Conservation Agent, Red Wing, Minnesota, and ELMER J. LUND, Extension Area Conservationist, LeMars, Iowa

10:15 A.M.—*Our Technical Committees in Action* — WALLACE MITCHELTREE, Rutgers University, chairman

Soil Surveys and Modern Farming—CHARLES E. KELLOGG, Soil Conservation Service, Washington, D. C.

1:15 P.M.—AFTERNOON SESSION

Optional—Tour arranged by Wisconsin Chapter, SCSA

Adjourn

Secretary's Column

One of the most difficult tasks in the national office is to develop a method of conveying information of *Society* activities to all members in a brief, clear and concise manner. There are many points I would like to discuss with you face to face but as that is impossible I will list a few.

Members who find it possible to attend will not want to miss the annual meeting in Green Lake, Wisconsin. A tentative draft of the program is listed on another page. The Wisconsin Chapter has made elaborate plans for your entertainment and comfort. Soon all members will receive information about accommodations or you may use the reservation form in this issue of the JOURNAL. Make your plans early. If you plan to travel by plane or train be sure to indicate your schedule on reservation so you may be met by bus for trip to the grounds of the American Baptist Assembly. Groups larger than ours meet regularly at the grounds so don't be dismayed by the details.

William J. Endersbee, chairman of the chapter programming sub-committee, recently reported to chapter officers for the committee: "We submit that the *Soil Conservation Society of America* is only as strong as its members and chapters are active. There is evidence that membership grows as chapter activity increases. The *Society* will only grow in membership and effectiveness as members are provided with incentives and tasks, and are encouraged to follow through. The 'let George do it' attitude should not prevail. Members and potential members must not be given occasion to regard *SCSA* as a sort of slot machine into which they insert their dues in the hope that something will come out."

The committee sent 10 suggestions to chapter officers as potential chapter activities. The list included proposals for working with schools, Boy Scouts, maintaining a speakers bureau, increasing membership and attendance at chapter meetings, participating in programs of the parent *Society*, etc.

Chapters have great opportunity to offer leadership to the conservation movement. Occasionally I hear chapter officers apologizing for having been elected chairman of their chapter, or occasionally they write saying they need speakers or ideas. I am prone to agree with R. Y. Bailey, past president of the *Society*, who recently stated he thought the first step was for chapter officers to call meetings, develop a planning session, adopt a schedule of activities and get underway. There are many examples this method will work.

If you are a member in a chapter that is very active—or conservatively active—why not "spur" your officers to greater accomplishments. They need your cooperation.

In regard to membership, we must correctly sell membership. Take time to explain the *Society* and its activities to your prospect. Membership means more than just a subscription to the JOURNAL OF SOIL AND WATER CONSERVATION! The *Soil Conservation Society of America* provides a common meeting ground for those individuals and groups interested in promoting correct land use. With dust bowls, floods, continuing erosion, soil depletion, depletion of forests and wildlife, along with encroachment of cities, airports, highways, etc., on agricultural land—we have a huge task.

Few organizations have the diversity of membership and as many leaders from all phases of the land use movement as does the *Society*. We have the forester, argonomist, engineer, soil scientist, biologist, geologist, hydrologist, farmer, rancher, administrator and others. Frankly and modestly the *Society* is the one organization where all meet on common ground. We encourage membership in specialized societies but in the *Society* the various interests meet.

Through active members, chapters, and a national organization, we can do much to "Advance the Science and Art of Good Land Use." To that end we are committed. We must increase our "sales campaign" and overcome our modesty and bashfulness in offering and providing leadership. Proper land use is fundamental to agriculture and to all other facets of life as we know it today.

The *Society* offers a dignified and proper outlet for the individual interested in good land use.

FACILITIES AVAILABLE FOR ANNUAL MEETING SEPTEMBER 12-14, 1955

The low daily rates include lodging, medical insurance, meal cost of $3.25 and full use of "over 1000 acres" of assembly grounds, buildings and recreational facilities.*

	Dormitory	3 or 4 Per Room	2 Per Room	1 Per Room
ROOMS WITH CENTRAL BATH AND TOILET				
Cottages: Moore and Parsons			5.00	
Tepee and Indian Village Dormitory	5.00	....	....	....
John Clarke Lodge		5.25	5.75	7.00
Brayton Case, Morehouse and Indian Village			5.75	7.00
ROOMS WITH SEMI-PRIVATE BATH AND TOILET				
Houses: Burton, Dawson, Kinbrook, Log, Saunders, Sunshine, 497, 542, 550, and 556			5.75	7.00
Houses: Delmar and Montgomery and (close to Inn) Lakeside, Lawson & Robbins		7.75	8.25	10.25
ROOMS WITH PRIVATE BATH AND TOILET				
Covenant House (Motel Type)			6.00	7.50
Roger Williams Inn		8.25	8.75	11.25

Price at left includes cost of room and meals.
Example: Cost per person in twin-bed room in lovely Roger Williams Inn is $3.25 for meals, $5.50 for room, only $8.75 total.

CHILDREN'S RATES: Ages 3 thru 11 years, in room with parents, ½ the "2 Per Room" rate. Under 3 yrs. $1.75 per day.

A limited number of housekeeping cabins (for 4, 6, 8 persons) at $4.50 to $9.50 per cabin per day with private or central bath and toilet, blankets and kitchen equipment, but not meals. (Meals may be taken at the Inn at cost up to $3.25 a day.)

*Golf, motor boat rides and conference fee is extra. The grounds, buildings and improvements have been provided by gifts from many people. Daily rates are held at a minimum to cover bare costs of operation and maintenance. The American Baptist Assembly, Green Lake, Wisconsin, is a non-profit organization.

REGISTRATION CARD

Fee Attached
$_____ (Advance Deposit $2.50 Per Person)

10th ANNUAL MEETING
SOIL CONSERVATION SOCIETY OF AMERICA

NAME _____ (Give age, if child) _____)
(Last name first) (Please indicate: Miss, Mrs., Mr., Dr., Rev.)

STREET AND NUMBER _____

CITY AND STATE _____ Church _____

(Please check whether address is Home....., Business.....)

DATE OF ARRIVAL ___BB ___AM ___PM ___EVE___ (BB, before breakfast; AM, before noon meal; PM, before eve. meal; Eve, after eve. meal)

DATE OF DEPARTURE BB___AM___PM___EVE___

TRANSPORTATION

ARRIVING BY: Auto ☐ Bus ☐ Train ☐ Plane ☐

PLEASE MEET ME AT _____

Date _____ Time _____ A.M. ☐ P.M. ☐

(Please do not write in this space)

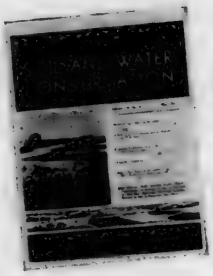
LIST HOUSING PREFERENCE

I plan to room with the following persons:

1. _____ _____
2. _____ _____
3. _____ _____

AMERICAN BAPTIST ASSEMBLY, Green Lake, Wisconsin

CONSERVATION MATERIAL FROM YOUR SOCIETY



Journal of Soil and Water Conservation

Official publication of the Soil Conservation Society of America. Published bi-monthly. Secured through membership, $5.00. Back issues $3.00 per volume.

Reprints as follows:

No. Pages	First 100 Copies	Additional 100 Copies
2	13.00	1.17
4	18.20	1.69
8	35.80	2.93
12	46.80	5.20
16	55.90	6.24

"Down the River"

Over 400,000 copies of this booklet, which colorfully explains and illustrates the need for conservation practices, have been distributed. Business firms, industries, soil conservation districts and many others use the back page for their advertising message.

Price: 10c per copy, $9.00 per 100; $85.00 per 1,000. F.O.B. Des Moines.

"The Story of Land"

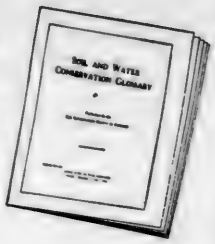
The conservation booklet for young and old. In 4 colors, it depicts "The Story of Land—Its Use and Misuse Through the Centuries." Excellent for schools, soil conservation districts, business firms, etc. Back page may carry the sponsor's message. First released in May of 1955.

Single copy 20c, 100 copies $7.50, 1,000 copies $45.00, 10,000 copies $400.00.

Glossary

Published in 1952 after five years of work and study by a special committee. All workers in soil and water conservation and related fields will find it helpful. College and high school agricultural departments use extensively. Thirty-seven pages 8½ x 11, paper bound, 900 terms.

Price: $1.00 per copy.



Mats of Cartoons by Felix Summers

Recent cartoons in Journal of Soil and Water Conservation entitled "Soil Conversation" are available in mat form for local newspapers. They are two columns wide. Three cartoons are ready.

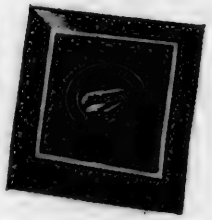
Price: $1.00 for first mat, 50c for each additional in same order. Very reasonable for soil conservation districts.

Emblem

The emblem of the Society shows the hand, representing man, protecting the earth which in turn is nourishing plant life with the sun and rain adding their contribution to complete the cycle well known to all conservationists.

Emblem is available to members and chapters in plaques, rings, lapel buttons, tie clasps. Ideal gifts.

Prices: Gold lapel buttons, $4.00, bronze, $2.25; Tie Clasps, $5.00; China Ash Trays, 75c. Write for other prices.



Order From

Soil Conservation Society of America
1016 Paramount Building, Des Moines, Iowa

The Story of Land

(*Continued from page 207*)

biologist for the Department of Conservation in Illinois, sharply criticized the publication because it missed many opportunities to promote the interests of wildlife management.

Elmer T. Peterson of the *Daily Oklahoman*, Oklahoma City, rapped the booklet because it pictures a large downstream dam. Mr. Peterson is author of the book "Big Dam Foolishness" and is of the opinion that a soil conservationist should not in any way promote the cause of large downstream structures when upstream work will accomplish the same results.

Several other verbal comments have been received about the art work, etc., but the booklet has been accepted . . . now the task is to distribute it to millions of Americans who are uninformed of their dependency on land.

The list of purchasers of the publication is too long to publish in its entirety, but the following have secured 1,000 or more copies:

Michigan State Soil Cons. Comm., Mich.	1,000
Soil Conservation Service, Spokane, Wash.	2,000
Iowa State College, Ames, Iowa	1,000
Paradise SCD, Mont.	1,000
Kiowa SCD, Colo.	1,000
State Soil Cons. Comm., Wisc.	2,000
East Polk SCD, Minn.	1,000
East Lamoure Co. SCD, N. Dak.	1,000
American Plant Food Council, Wash., D. C.	1,000
Citizens National Bank, Bowling Green, Ky.	1,000
Antelope Valley SCD, Lancaster, Calif.	1,000
Pendleton SCD, Ky.	2,000
Mission Soledad SCD, Calif.	1,000
Saginaw SCD, Mich.	1,000
Manistee Co. SCD, Mich.	2,000
Soil Conservation Service, Portland, Ore.	1,000
Marshall Co. SCD, S. Dak.	1,000
Todd Co. SCD, S. Dak.	4,000
Arkansas-Missouri Power Co., Blytheville, Ark.	1,000
Vermilion SCD, Danville, Ill.	1,000
State Soil Cons. Comm., Athens, Ga.	1,000
International Harvester Co., Chicago, Ill.	2,000
Merchants and Planters National Bank, Gaffney, S. Car.	1,000
Gloria SCD, Salinas, Calif.	1,000
Commercial National Bank, Union, S. Car.	1,000
South Carolina National Bank, Newberry, S. Car.	1,350
Lewis & Clark Co. SCD, Helena, Mont.	1,000
Boulder Valley SCD, Boulder, Colo.	1,000
Merchants and Planters Bank, Wilnsboro, S. Car.	1,000
Victor Fertilizer Co., Chester, S. Car.	1,000
Jackson Co. SCD, Altus, Okla.	1,000
Avoyelles-St. Landy SCD, Marksville, La.	1,000

1956 Annual Meeting Announced for Tulsa, Oklahoma

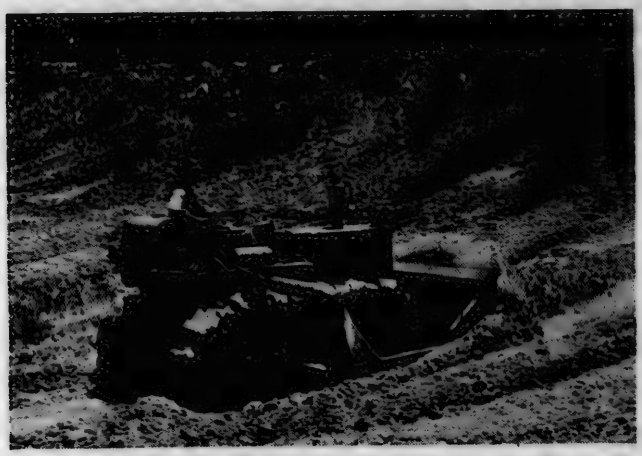
The eleventh annual meeting of the *Soil Conservation Society of America* will be held in Tulsa, Oklahoma, October 15, 16, 17, 1956, according to Dr. Austin Patrick, president.

On May 27, 1955, 20 Oklahoma and Texas members met in Tulsa to discuss advance plans for the meeting. K. C. Bennett of Miami, Oklahoma, served as chairman of the meeting, Myron J. Hurd of Claremore, Oklahoma, chairman of the Northeast Oklahoma Chapter, has been named chairman of local arrangements for the meeting.

A delegation from Oklahoma will be in attendance at the 10th annual meeting in Wisconsin, September 12, 13, 14, 1955, to tell of their facilities and advance arrangements.

Turn a "tin roof" into a "rain barrel"

. . . with an International® diesel crawler!



To *rip open* hard-baked soils so water soaks down instead of running off . . . and for tool bar tillage, *unlimited* . . . you can't beat an International TD-9 diesel crawler and combination carrier. This investment-cutting, deep tillage unit can subsoil *two feet down*, break pan, chisel or stubble-mulch. The International crawler has exclusive ball-joint-mounted track frames, to keep positive, full-load traction. And International diesel governing gives you maximum horsepower at *rated engine speed* as well as maximum *overload lugging* power!

. . . 'Doze a dam with same outfit!

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Ralph Hay Writes From India

Ralph C. Hay, of the University of Illinois and well known to members of the Society, is now located at the Indian Institute of Technology, Karagpur, India, where he is head of the agricultural engineering department.

In a letter mailed February 26, he stated: "I have been here in India for the past year as visiting professor under a sisterhood contract between the University of Illinois and the Indian Institute of Technology. I teach soil conservation to students in agricultural engineering and also civil engineering. We are getting some research under way on land use of the upland lateritic soils of this part of India. The agriculture of this area is predominantly one crop, rice, and the upland not suited for rice is used very little for crops in spite of an annual rainfall of 60 inches. The upland is badly overgrazed and serious erosion is evident.

"Next week we are taking our students on an educational tour into the upper catchment of the Damodar River to see the soil conservation work being started by the Damodar Valley Corporation (the TVA of India) above its system of hydroelectric, irrigation and flood control dams. Wilson Hull, a former Soil Conservation Service specialist from South Carolina, is working there with Indian conservationists.

"In December I attended the annual meeting of the Soil Conservation Society of India at Patna. One of the major topics was upstream flood control, a strangely familiar subject.

"Extend my best wishes to our friends in soil conservation work. I expect to be back at the University of Illinois in 1956."

Chairman Steinberger Offers Suggestions to Border Chapter

The annual meeting of the Border Chapter was held in Minot, North Dakota, on May 26 with 30 members and guests in attendance.

Chairman H. J. Steinberger made the following recommendations for future officers of the chapter:

1. Meetings should not be held in conjunction with other conferences.

2. Ladies should be encouraged to attend.

3. Non-member friends from all agencies and groups interested in good land use should be invited.

4. Members would be interested in a tour of a watershed.

Truman Anderson, Jr., reported on the Jacksonville meeting. Several items of business were transacted including the start of some cooperative projects with other chapters in North Dakota.

Elected chairman for the coming year was Allen Fisk of Devils Lake, William H. Purdy of Mohall was elected vice chairman and Elmer R. Umland of Fessenden was elected secretary.

Four Advertisers Use Color

For the first time since the JOURNAL OF SOIL AND WATER CONSERVATION started publication in 1946, four pages of color advertising are included in this issue. Firms using color include: Deere and Company, Austin-Western, Ford Tractor Company, and Climax Molybdenum Company.

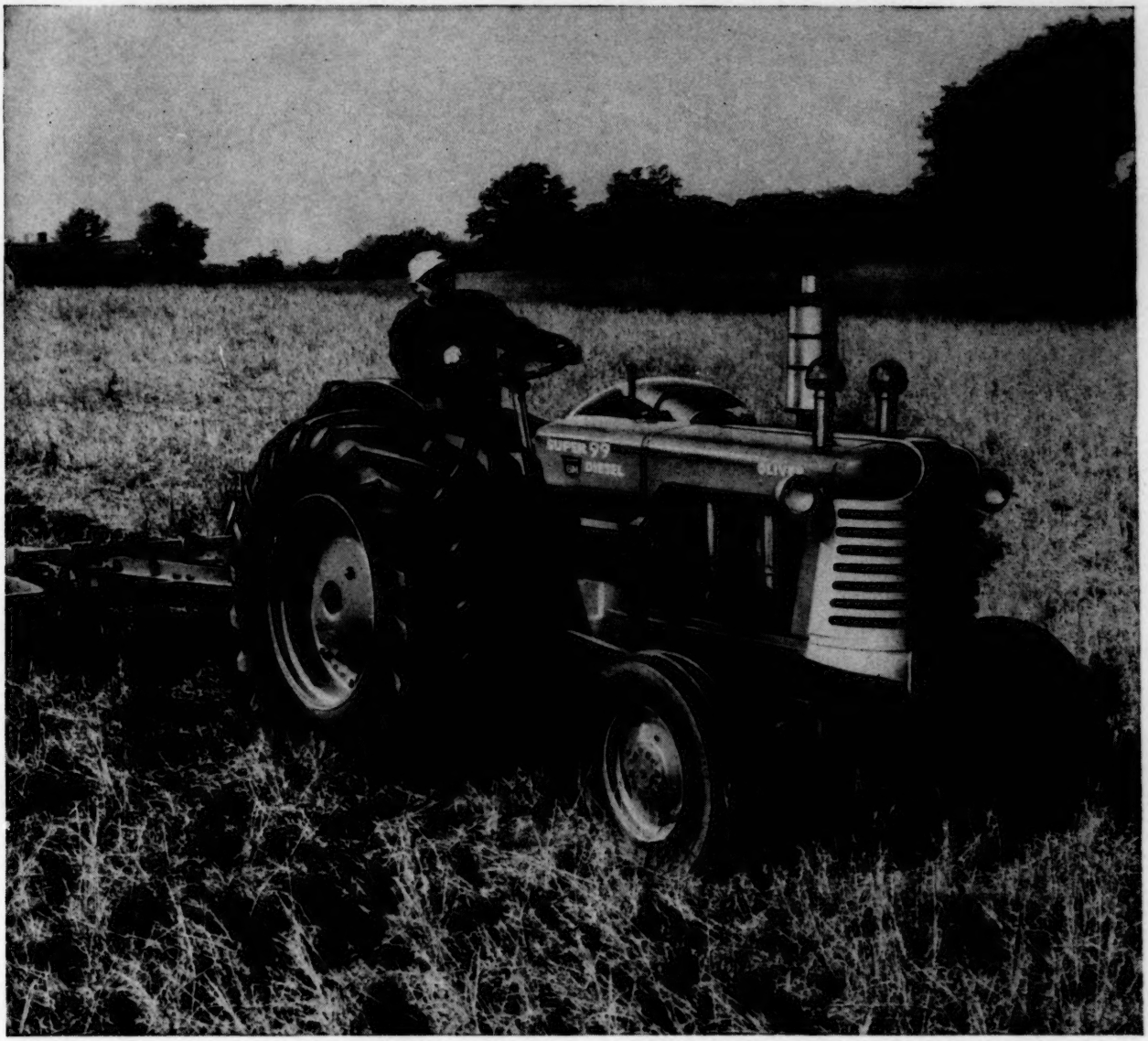
Climax Molybdenum Company is a new advertiser in the JOURNAL and have insertions planned through the remainder of 1955.

The *Society* is indebted to the industries and firms that have supported the JOURNAL with advertising. Members are urged to contact them and to mention their advertising in the publication.

Arizona Chapter Views "Back to Eden"

On March 29 Arizona Chapter members gathered in the Sky Room of the Phoenix Public Library for their meeting. James E. Middleton, chairman, opened the meeting and conducted the business session. W. E. Anderson was in charge of the program and introduced Mr. French of the Bureau of Land Management who had just returned from Jordan where he worked for the FOA program. The film, "Back to Eden," depicted the work of FOA in that country.

Other films shown included "Grass the Elko Way" and "The Formation of Soils."



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It's one of the most popular and widely known engine types made—a famous General Motors diesel in use right now by the thousands on more than 750 different kinds of power jobs everywhere in the world.

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The Super 99 GM Diesel is a new concept in farm tractor power that offers many other design advancements as well—like six forward speeds ...big, flat platform...rubber-spring seat and double-disc brakes—features that increase performance and productivity, and make operation easier and safer.

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*Corrected horsepower ratings observed during manufacturer's tests.

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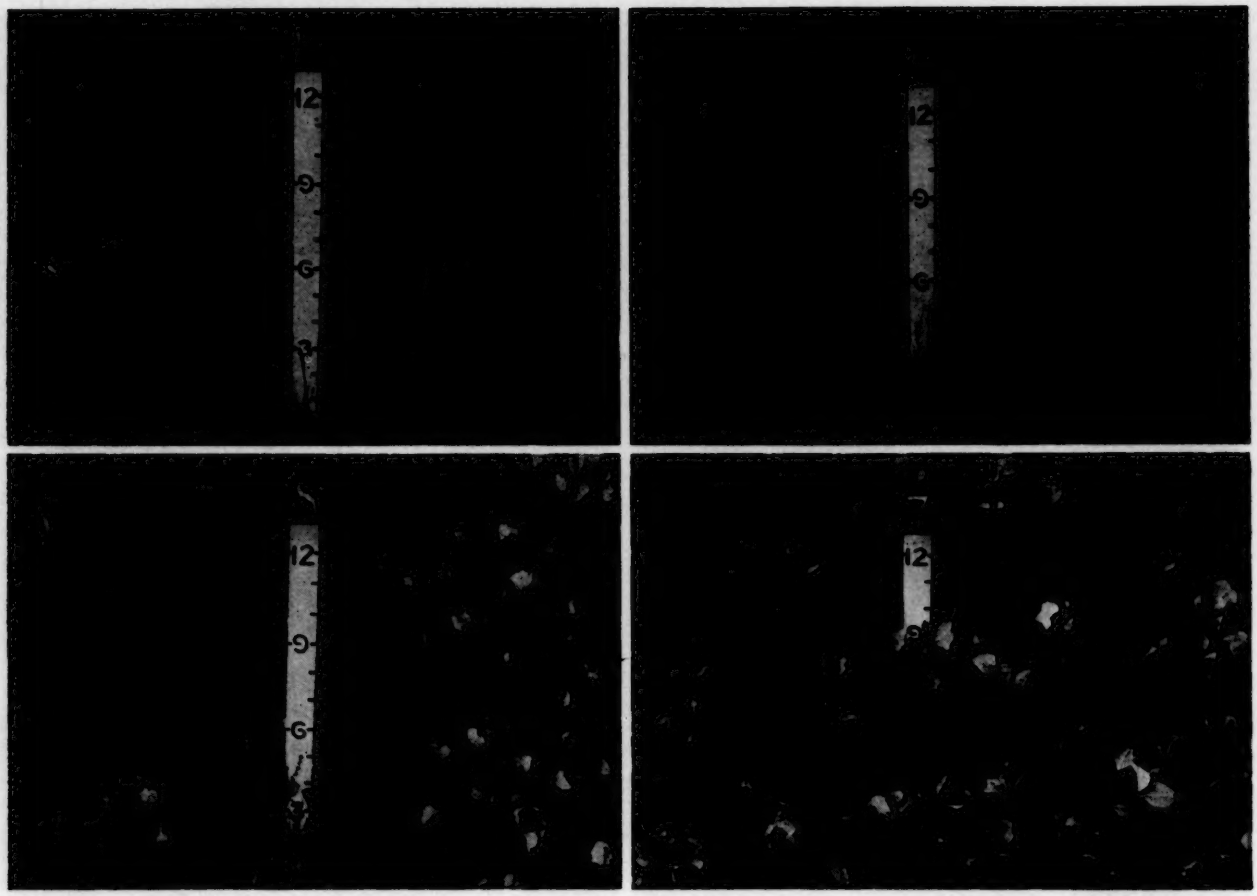

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In these test plots, A. J. Anderson and D. V. Moye* showed that treating a highly acid soil (pH 4.6–4.9) with traces of moly reduced lime requirements to only 1/10 ton an acre.

PLOT 10 — **CONTROL.** With only a basal dressing of superphosphate no clover could be established.

PLOT 9 — **MOLYBDIC OXIDE 2 OZ. AN ACRE.** Molybdenum alone was not effective in improving yields.

PLOT 8 — **LIMESTONE 1/10 TON AN ACRE.** Liming gave some improvement even at this low rate, but much heavier dressings were needed for good yields.

PLOT 7 — **MOLYBDIC OXIDE 2 OZ. AND LIMESTONE 1/10 TON AN ACRE.** When traces of moly were added, light liming increased clover yields ten-fold over the control.

**Austr. J. Agric. Res.* 3, 95-110 (1952).

MA5-10

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